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The Projected Impact of Environmental Forces on Programs of Study in Selected Departments in the Science and Education Faculties at the Universities of Alberta and Calgary: 1983-1988.

University — Université
University of Alberta

Degree for which thesis was presented — Grade pour lequel cette thèse fut présentée
PhD.

Year this degree conferred — Année d'obtention de ce grade 1984.	Name of Supervisor — Nom du directeur de thèse E. Ingram

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THE PROJECTED IMPACT OF ENVIRONMENTAL FORCES ON PROGRAMS OF STUDY IN SELECTED DEPARTMENTS IN THE SCIENCE AND EDUCATION FACULTIES AT THE UNIVERSITIES OF ALBERTA AND CALGARY: 1983-1988

by

© GERALD PETER SELLINGER

A THESIS
SUBMITTED TO THE FACULTY OF GRADUATE STUDIES AND RESEARCH
IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE DEGREE
OF DOCTOR OF PHILOSOPHY

DEPARTMENT OF EDUCATIONAL ADMINISTRATION

EDMONTON, ALBERTA
SPRING, 1984

UNIVERSITY OF ALBERTA

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ABSTRACT

This study had three main purposes. The first was to identify environmental forces both within the universities and outside which are expected to have an important impact on the operations of certain departments in the Faculties of Science and Education at the Universities of Alberta and Calgary in the years 1983-1988. The second was to forecast the effects of the forces on programs of study offered by the departments. The third was to outline practical options available to the departments for dealing with the difficulties expected in the area of future programming. The study also had a secondary purpose. This was to identify important differences in the responses of the groups representing the two faculties.

Data collection proceeded according to a technique somewhat resembling the Delphi method. Three separate rounds of questioning were carried out. Each round brought new data based on that of the round before. Respondents were chosen for their expertise in terms of direct administrative and professional experience in the faculties and departments involved. Procedures of content analysis were used to analyze the data.

Difficulties in data gathering were encountered. Fully one-half of the respondents who had agreed to participate in the study failed to return the first-round questionnaire. This made necessary a departure from the conventional Delphi format. In Round II additional respondents were contacted and given questionnaires. In Round III interviews were held with certain key respondents in lieu of a third questionnaire.

The environmental forces forecasted by respondents as potentially the most important to the operations of the selected departments in the coming years were monetary forces, forces relating to the internal operations of the universities, and computer technology. Effects of the forces on study programs were predicted to be mostly in the area of admissions. Only minor impact was forecasted for the areas of program content and instructor/student interaction. Suggestions of options available to departments for overcoming difficulties in future programming centred on the problem of declining financial resources. Options tended to emphasize the need to reduce time commitments of instructors and increase department revenue. Significant differences were found in the response patterns of representatives of the two faculties involved in the study. They occurred in the areas of the forecasted likelihood of certain forces affecting the departments and the forecasted impact of the forces on the content of study programs.

Possible adjustments which universities are expected to consider in response to the deepening financial crisis in the longer term were grouped into three categories. The first is a reorganization of the overall plan of operation with the aim of increasing cost effectiveness. This will mean increased centralization with greater attention to procedural rules. It will also mean the reduction of areas in which services are offered, the redefinition of obligations to employees, and a re-examination of means of obtaining revenue. The second category of adjustments expected is the development of a systematic means of distributing resources. Requests for increased levels of support by organizational units will be outlined in terms of the increased quality of services to be provided as a result. The third category is the development of procedures for increasing effectiveness in management. Administrators will be expected to resemble more closely managers in public- or private-sector organizations in terms of attitudes and skills than professors.

As a result of this study a number of recommendations for further research were derived.

ACKNOWLEDGEMENTS

First, I would like to thank Dr. E.J. Ingram, my supervisor, for his time and guidance. Also, I would like to thank Dr. D.A. MacKay, Dr. E.W. Ratsoy, Dr. D.G. Wangler, and Dr. L.W. Downey, the members of my committee, for their contributions. In addition, I would like to thank Dr. R. Bryce for his assistance in the early stages of the study.

Second, a note of appreciation to Mrs. C. Prokop for her advice and help with the quantitative sections of the study.

Also, thanks are due to Mrs. C. Olthoff for her assistance in typing and processing the thesis.

Finally, a word of gratitude to my wife Wendy Fay and my children Jenny and John for their patience and encouragement.

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CHAPTER 1

Introduction

The suggestion is made repeatedly in the literature that the 1980's will prove to be a difficult period for North America's universities. Various conditions present in the external and internal environments of the universities are expected to force them to adopt policy positions and practices which differ significantly from those adhered to in the past. Fincher, Furniss, et al. (1978) and Patton (1979), for example, argue that the 1980's will be a period of absolute decline for universities. The situation in at least some institutions, however, remains one of modest growth based upon continuing high levels of demand for instruction. There is, therefore, a serious incongruency between the forecasts of the condition of North American universities which appear in the literature and the reality of the situation in 1983.

With this incongruency in mind, one might characterize the future of universities more accurately as one of uncertainty. This uncertainty points to the need for extra care in planning for university development in the coming years.

Planners should consider information from a wide range of sources when constructing strategies for university development. Expert individuals in the areas of university faculty and department operations represent one useful source of information. Experts may actually hold an advantage over professional planners. Professional planners, according to Barrington (1981), are institution-bound and constrained by vast amounts of quantative data. Experts, however, if allowed to make forecasts in an atmosphere of maximum freedom, may overleap some conventional planning problems through intuition. In any case, there is a need for data relating to future university development and expert opinion should prove helpful to planners.

Statement of the Problem

The purpose of this study was to identify environmental forces expected to influence selected departments in the Faculties of Science and Education at the Universities of Alberta and Calgary in the years 1983-1988, to forecast the impact of the environmental forces on programs of study offered and to outline options available to the departments for dealing with problems expected in relation to program development.

The major questions addressed were:

1. What forces present in the internal and external environments of the universities are expected to have an impact on the operations of the selected departments in the next five years?
2. What are the expected effects of the environmental forces on admissions to study programs, the content of study programs, and instructor/student interaction in programs?
3. What practical options in terms of organization and policy-making are available to departments for dealing with the problems expected in the area of program development?

4. What differences exist in the response patterns of the groups representing each of the faculties studied?

Significance of the Study

On the theoretical level, the study contributes to a greater understanding of the operations of open systems in response to uncertain environmental conditions. Emery and Trist (1965) theorize that as environmental conditions become increasingly turbulent organizations tend toward greater levels of flexibility and dynamism in structure and process. Meyer and Rowan (1978) state that as environments change so must organizations' formal structures. This study provides useful data on how some open systems function in uncertain environments in their attempts to ensure a balance between the inflow of energy, the outflow of products, and appropriate relations between their parts.

In practical terms, the study represents a compilation of expert opinion of trends over the next five years with regard to the demand for university education in Alberta, the internal operations of universities, and the nature of relations between universities and significant other institutions. It is, therefore, useful for the purpose of university planning in general. The study also confirms the need for change in academic study programs. Thus, it is useful to anyone interested in university curricular reform.

Definitions

Internal Environment of a University

The total set of influences arising from the activities of individuals and groups within the formal boundary of a university.

External Environment of a University

The total set of influences arising from the activities of individuals and groups outside the formal boundary of a university.

Environmental Force

A specific environmental condition associated with economic, social, political, legal, demographic, or technological activity.

Operations of a Department

The total set of processes and actions including administration, research, and teaching normally carried out by all persons within a university department.

Program of Study

A more or less logical sequence of operations, activities, and processes leading toward formal recognition of competence in some area.

Limitation

The study is limited by the fact that the research technique chosen was not applied in its pure form throughout. Data gathering involved three rounds of questioning. Round I saw a poor rate of return of questionnaires (50 percent). As a result, the research method was modified substantially in Rounds II and III.

Delimitation

This study identifies environmental forces expected to influence the operations of selected departments in the Faculties of Science and Education at the Universities of Alberta and Calgary in the next five years. It then outlines changes in study programs anticipated by experts in response to the action of the environment. Finally, it presents some practical options available to departments for dealing with the problems expected in relation to program development.

Legislative and regulatory personnel outside of the universities and pressure groups operating both inside and outside of the universities were not surveyed. One may suggest that the involvement of more categories of respondents would have yielded a more "balanced" set of data. On the other hand, involvement of individuals from areas only indirectly connected with the delivery of programs of study may have resulted in challenges to the validity of the data. Inasmuch as the focus of the study was on details of operation of individual departments the decision was taken to use only experts involved directly in department work.

Each faculty and department in a university operates in an environment at least partly specific to itself. Each environment may be composed of accrediting agencies, particular industries, government departments and specific subsets of the public at large. Thus, the findings of this study should be applied carefully if used to interpret the problems of faculties or departments other than those studied.

Inasmuch as the study reflects the philosophies, policies, and problems of the Alberta system of universities, the findings may not apply to situations in other regions.

Organization of the Dissertation

This chapter contains a brief introduction to the problem. Also, explanations of various aspects of the study are covered including its significance, the definitions used, some possible limitations, and the specific delimitation.

Chapter Two is devoted to a review of the literature relating to the problem. The literature review focuses on three specific areas. The first is the nature of organizational environments, the second is organizations' responses to environments, and the third is organizational environments of universities.

Chapter Three covers explanations of the design of the study and the methodology used. Descriptions are provided of the specific procedures followed in gathering and analyzing the data. The third chapter also contains a brief section explaining the difficulties encountered in the study arising from the research technique used.

The fourth chapter consists of an outline and general discussion of the Delphi technique. Delphi is considered in terms of its philosophic associations and its general methodology.

Chapter Five has two main sections. The first contains an outline of the historical development of most of the faculties in Alberta's universities with attention to the environmental forces acting on the universities over the years and their effects in terms of general trends in the development of study programs. The second section comprises a survey of theoretical perspectives on program development for the future.

Chapter Six covers the description and analysis of the data. Data were gathered in three separate rounds of questioning. Each questionnaire was based on the information gathered in the round before. In the presentation and analysis of the data the round-by-round format is used.

The last chapter contains a summary of the study. The research problem is outlined, the methodology is reviewed, and the findings of the study are summarized. Also, some implications of the findings for university operations in the longer term are outlined. Finally, several recommendations for further research are presented.

CHAPTER 2

Review of the Literature

The concept of an influential environment is fundamental to the theory of open systems. An open system is inextricably bound to the particular conditions of the environment in which it operates. Therefore, any attempt to understand the operations of an open system should regard as primary the nature and potential effects of the environment.

This review contains two main sections. The first addresses the characteristics of environments in which organizations function as well as the nature of organizations' responses to environments. Environments are generally seen by authors as external to organizations and as significant in shaping organizations' structures and processes. The second section focuses on the organizational environments of universities. The basic concerns in the second section are the roles played by individuals, groups, and institutions (both inside and outside of universities) which influence university operations.

Organizations and Their Environments

Open-System Theory

In modern organization theory organizations in general are conceived of as open systems. System openness, according to Katz and Kahn

(1971:16) refers to "the degree to which [a] system is receptive to all types of influence." This means that systems vary with regard to the types of inputs with which they can interact as well as with the degree of influence which a particular input can have.

The following is a summary of the common characteristics of open systems as outlined by Katz and Kahn (1969):

1. An open system imports energy from its environment. No open system is able to operate indefinitely without taking energy (people and material resources) from its environment.
2. An open system uses the energy to process materials or provide services. This means that inputs are reorganized using the energy taken from the environment.
3. An open system exports some product or service into the environment.
4. The product or services exported into the environment provides, either directly or indirectly, the energy needed to repeat the cycle of activities.
5. In order to survive an open system must develop a comfortable margin of operation in terms of stored energy. It does this by taking more energy from its environment than it uses and storing the remainder.
6. An open system receives information regarding its relations with the environment. It selects certain segments of this information for use in keeping to its course.

7. In order to survive an open system must maintain a steady state. This means that there must be a continuous inflow of energy, a continuous outflow of products, and a balance in the energy ratio and in relations between its parts.
8. An open system tends to move toward differentation and elaboration. In the early stages of the operation of a system the components interact with a high degree of dynamism. Later, conditions constraining interactions among components are established.
9. Open systems demonstrate equafinality, i.e., there exists the potential to reach the same final state from differing initial conditions and by a variety of paths.

"An open system (in contrast to a closed system), by its very name requires the consideration of how the external environment influences the internal properties of an organization" (Negandhi, 1975:1). This remark points to the significance of the environment within which open systems operate. The nature of the environment is crucial to any open system in that the concept of openness suggests vulnerability to environmental forces. Open systems must interact with environmental components for the purposes of setting up and maintaining exchange relations involving resources.

Gibson, Ivancevich, and Donnelly (1979) view individual organizations as elements of a larger system. The existence of any organization in this context is a function of its capacity to contribute to the larger system. And, in order to continue contributing an organization must remain effective. It must interact with its environment continuously and on the basis of information gained it must anticipate conditions in the environment and adjust itself accordingly. In short, it must adapt.

Before moving to a review of the general characteristics of organizational environments let us reiterate the importance of regulation in open systems by recalling the words of Katz and Kahn (1971:28):

> Organizations do not exist in a static world. The surrounding environment is in a constant state of flux and a rigid technical system, though preserved by an excellent structure, does not survive.

Characteristics of Environments

Most authors see the environment within which an organization operates as a phenomenon external to the organization and functioning to constrain it in some way.

Emery and Trist (1965) outline four ideal environmental types in terms of the turbulence and the interconnectedness of the parts. In the simplest environmental type (the placid, randomized environment) goals and noxiants are randomly distributed and more or less unchanging. The second type (the placid, clustered environment) is static in the sense that the goals and noxiants are more or less unchanging. The difference is that the goals and noxiants are not distributed at random in the environment but instead form clusters in response to some set of principles. In the third type (the disturbed-reactive environment) there is a dynamism arising from interactions between systems in competition. Still, in this type, however, the effects of the competition are restricted to changes in the systems themselves and do not affect the nature of the overall environment. In the fourth environmental type (the turbulent environment) there is dynamism on two levels. The first is the dynamism resulting from competition between systems as in type three. The second is turbulence in the overall environment resulting from the intense competition and activity of the systems. The activity of the systems in pursuit of their goals makes turbulent the otherwise placid field.

Dill (1958) uses the term relevant environment. This covers organizations, groups, and individuals which exercise a direct influence on an organization. Thompson (1967) suggests the term task environment to indicate those parts of the overall environment which are relevant or potentially relevant to the effectiveness and survival of an organization. Hall (1972) differentiates between general and specific environments. The term general environment covers those factors which affect an organization indirectly. Some examples are political, economic, social, demographic, and technical conditions. Hall's (1972) specific environment refers to components in the overall environment with which an organization interacts directly. Thus, Hall's (1972) concept of a specific environment is basically the same as Dill's (1958) relevant environment and Thompson's (1967) task environment.

The idea that organizational environments are evolving is presented by Terreberry (1968). She suggests that evolving environments are acting on organizations such that levels of change induced from within are decreasing and levels of change induced by external forces are increasing. In today's evolving environments other organizations, for example, are taking on increased significance in relation to the operation of any focal organization.

Tosi and Carroll (1977) view organizational environments as either stable or volatile. "The stable environment is one in which changes are relatively small occurring in small increments, with a minimal impact on the structure, processes, and output of an organization" (Tosi and Carroll, 1977:171). The stable environment is marked by a high level of predictability given basic economic data. The volatile environment is characterized by a high degree of turbulence. Changes are more rapid, random, and intense. In a volatile environment prediction is difficult.

The term relevant is also used by Tosi and Carroll (1977) to describe those aspects of the overall environment which have a direct influence on the inputs, operations or outputs of an organization. Within the relevant environment of an organization they then distinguish between the market environment and the technological environment. The market environment refers to the demand for a product or service. The technological environment refers to the availability of physical techniques which an organization can use to alter its system of production and the knowledge upon which production is founded.

Pfeffer and Salancik (1979) interpret organizational environments in terms of levels of uncertainty. This conception is based on the following factors: (1) the degree to which power and authority are dispersed in the environment, (2) the availability of key resources, and (3) the nature of the connections between organizations. Conditions with respect to these factors shape relations among organizations and inevitably result in the development of some pattern of conflict and interdependence. This conflict and interdependence, then, gives rise to the uncertainty which confronts an organization.

Gibson, Ivancevich, and Donnelly (1979) theorize that each organization interacts with an overall environment consisting of four subenvironments: input, output, technology, and knowledge. Organizations take inputs and process them through the application of technology into outputs. All of this is carried on within the framework of relevant knowledge. Each of these subenvironments is subject to considerable change and may exhibit dynamic properties exclusive of those of the other subenvironments.

As regards external environmental forces which act on organizations Gibson et al (1979) define three categories: those arising from dynamics in the marketplace, those relating to changes in technology, and those relating to political and social change. Marketplace forces originate from two sources. The first is competition from organizations offering the same goods or services. The second is the condition of that section of the marketplace from which the organization takes its resources. Technological forces acting on an organization arise from the fact that technological developments which reduce production costs and improve the quality of products or services may be financially beneficial to an organization in the long term. Thus, organizations must keep abreast of technological developments which could affect them. Political forces are significant, according to Gibson et al (1979), due to the fact that connections between public and private sector organizations are increasing. Social forces are important in that organizations must recognize and adapt to mass change.

Organizational Responses to the Environment

Responses by organizations to changes in the characteristics of the environment are most often viewed by authors as being of two basic types. The first is structural change. The second is change in the general orientation and behaviour of personnel.

Emery and Trist (1965) propose a series of organizational responses in connection with their description of organizational environment ideal types. In response to a placid, randomized environment organizations tend to operate on a local basis. Their structures and operating processes are shaped by local environmental characteristics. In response to a placid, clustered environment organizations tend to differentiate strategy from tactics. In practice, this means that divisions tend to show subordination to a central plan. There is competition among organizations in this type of environment and, therefore, precise knowledge of the environment can mean the difference between survival and extinction. Organizations operating in a placid, clustered environment also require a concentration of resources. In responding, organizations tend to increase in size. Organizations operating in a disturbed-reactive environment move a step beyond differentiating between strategy and tactics. They introduce a concept which Emery and Trist (1965) call operations. This means that each organization must be aware that what its members know about the environment is also known by the members of competing organizations. Each organization, therefore, attempts whenever possible to hinder the development of competing organizations. Each organization takes actions aimed at "putting off" other organizations. As an effect of this, organizations tend to become decentralized. Organizations operating in a turbulent environment tend to rely heavily on research and development divisions and tend also to be highly flexible and dynamic in structure and process.

Lawrence and Lorsch (1967) studied three types of industries each of which existed in an environment which was significantly different from that of the others. Their findings were basically that organizations tend to develop and maintain conditions of differentiation and integration which correspond to the diversity of the environment in which they operate. Organizations which function in dynamic and complex environments must be highly differentiated and highly integrated.

Aiken and Hage (1968) found that the higher the level of interdependence among organizations the greater the innovativeness and the more complex and decentralized organizations tend to grow.

Aiken and Hage (1968) and Thompson (1967) agree that the greater the level of environmental uncertainty the greater the problems of internal coordination and control in organizations. Terreberry (1968) suggests that the greater the level of uncertainty in an environment the more flexible will be the structure of an organization.

Tosi and Carroll (1977) also view the structures of organizations as shaped by the environments in which they operate. They propose a set of organizational types in association with their own characterization of organizational environments. Tosi and Carroll (1977) view the texture of organizational environments as either stable or volatile and the relevant environments of organizations as comprising technology and markets. With these concepts in mind they propose the following set of organizational types: (1) in response to an environment in which both the market and the technology are stable, bureaucratic, hierarchical organizations, (2) in a situation in which the market is stable and the technology is volatile, organizations which are dominated by their research and development divisions, (3) in a situation in which the technology is stable and the market is volatile, organizations which are dominated by their marketing divisions, and (4) in an environment in which both the technology and the market are volatile, organizations which exhibit maximum levels of flexibility and dynamism.

The idea that the formal structure of an organization is a function of some environmental ideology relating to its activities is presented by Meyer and Rowan (1978). "As the environmental ideology changes, so does the formal (organizational) structure" (Meyer and Rowan, 1978:108). In other words, environmental realities are incorporated and reflected in organizational structures. The creation of new structures can typically be traced to some environmental alteration. Organizations react to environments by "taking into account" environmental changes in the form of structural alterations.

Organizational Environments of Universities

External Environments

Declining autonomy. The main preoccupation of authors concerned with the external environments of universities is the gradual erosion of university autonomy. Organizations outside the universities, the most significant of which are governments, are acquiring ever greater levels of influence in university operations. Opinions differ as to the precise causes of this. Some authors see it as a direct result of the actions of universities themselves. Implicit in this view is the idea that universities today are incapable of managing their affairs without assistance. Others view the situation as essentially an attempt on the part of governments and other regulatory groups to impose upon universities greater degrees of coordination and control. In any case, the effects of declining autonomy for universities are generally regarded as negative.

Hatfield (1970) and Phnister (1976) believe that current conditions of declining autonomy for universities are the result of actions on the part of the universities themselves. Hatfield (1970), in analyzing the shift in the public's attitude toward universities from that of trust and support to that of suspicion and hostility, suggests that the primary cause has been student unrest and institutions' responses (or lack of responses) to it. He suggests that governments have seized this opportunity to take greater control of the operation of universities.

As well as student unrest, Pfnister (1976) blames faculty politicization for the declining autonomy of universities. He suggests that university managers have found it impossible to respond adequately to the conflicting pressures brought upon them by increasingly militant groups within universities. The combination of these factors and the fact that universities in recent years have experienced a significant loss of public confidence Pfnister (1976) regards as the cause of the loss of autonomy for universities. Pfnister (1976) sees the trend as eventually resulting in entirely new kinds of relationships between both universities and the various interest groups within them and between universities and other institutions.

Kerr (1973), Chambers (1976), Kaysen (1979), Elliott (1979), and Enarson (1981) hold that blame for the erosion of university autonomy must rest with organizations and conditions external to the university. Chambers (1976) points to encroachments by statutory agencies into traditionally free areas under the guise of a need for greater coordination of effort within legislative boundaries. In response to the tendency toward centralized control Chambers (1976) states that there is no necessity for the degree of coordination among academic communities that is required by industrial organizations. Instead, Chambers (1979) argues that a university is more than a knowledge factory. He suggests that decentralization and the diversity resulting from it would serve better the purpose of inspiring scholars and students.

Kerr (1973) outlines a number of forces from outside the university which are contributing to the shift in the power base. These include: (1) the demographic change which is causing universities to experience reduced rates of growth, (2) changes in the labour market for graduates, (3) new technology which is changing communication patterns and modes, (4) the development of alternative types of post-secondary educational institutions, and (5) the reemphasis by society of the importance of the individual.

Kaysen (1979) states that government regulations subvert the academic enterprise and could ultimately destroy its capacity to function effectively.

> At the extreme, regulation is seen as threatening to impair the capacity of academic institutions to perform their functions effectively by transferring crucial decisions on who should teach, who should be taught, and even what should be taught from the academic community that is competent to make them into governmental bureaucracies that are not.

Enarson (1981) regards the operations of regulatory groups as generally debilitating for universities. He advises developing some balance between autonomy and accountability.

Elliott (1979) believes that in the past fifty years industrial and business groups, labour groups, and private foundations have acquired unhealthy levels of control in universities. Universities today are in the process of losing academic freedom to special interest groups whose objectives are camouflaged by guidelines and regulations. Interest groups contrive to use universities in their efforts to reach their objectives. Elliott (1979) views these practices as an affront to the integrity of universities.

Academic and regulatory personnel. Significant differences in orientation exist between academic and regulatory personnel. These differences seem to be associated with the differences in the functional role of each group. The implications for relations between universities and regulatory groups are wide-ranging.

Sirluck (1977), in analyzing relations between provincial governments and universities, states that differing objectives between university administrators and government officials have led in recent years to a decline in relations between universities and governments. One effect of this on the part of governments, according to Sirluck (1977), has been the abridgement of commitments to university development.

Worthley and Apfel (1978) suggest greater participation by universities in the development of public policy. As part of their analysis they discuss current barriers to increased participation by universities. These include a basic distrust between academic and legislative personnel, the incompatibility between the need for urgency on the part of legislators and reflective tendencies on the part of academic personnal and the absence of communication networks to match faculty expertise with appropriate policy problems.

Chambers (1976) calls on external agents to view universities not as mechanisms assembled with wrenches such that parts can be removed and discarded or attached from outside. Such practices, Chambers (1976) argues, tend to impair the functioning of a university. Instead, universities should be viewed as organisms which slowly evolve to fit the demands of their environments.

Internal Environments

Kerr (1973) presents the following list of pressures currently acting on universities from within: (1) student demands for more influence in operations, (2) conflict between demands in terms of more areas of specialization by students, on the one hand, and, on the other, the generally low level of flexibility on the part of academic staff, (3) increasing interest in collective bargaining on the part of academic staffs, (4) increasing divergence among academic staff members regarding academic matters, (5) pressure from women and ethnic minorities for academic staff positions, and (6) a greater tendency toward counter-cultural lifeways among both faculty members and students.

Kerr (1973) believes that the action of these forces will result in the internal environments of universities becoming more dynamic and fraught with conflict than has been the case in times past. In connection with this the function of administrators can be expected to be primarily that of managing conflict and change. Administrators can be expected to grow to resemble political leaders. They will need to concentrate on "the selection of goals, the procurement and assignment of means, the achievement of consent for new approaches, and the interpretation of the new order to interested publics" (Kerr, 1973:46).

Perhaps the two potentially most influential forces in operation on the inside of universities (at least as judged by the frequency and intensity with which they are discussed in the literature) are increased levels of collective bargaining on the part of faculties and continuing demands by students for a greater voice in governance. Attention moves now to a brief review of each of these in turn.

Faculty bargaining. According to Garbarino (1975), academic staffs are tending to organize in order to realize the following goals: (1) greater status in institutional governance, (2) job security, and (3) improved salaries and benefits. He further suggests that faculty unionism, although unspectacular, will continue to grow and will eventually present a significant force in the operation of universities.

As regards the effects of increased levels of faculty bargaining, Kemerer and Baldridge (1976) believe that the power of senior university managers and trustees will increase. Power will shift upward as subordinates grow less willing to make decisions.

Corson (1975) speculates that the continued unionization of academic staffs in universities will eventually mean:

1. Polarization of the situation with faculties on one side and administrators and trustees on the other.
2. A more explicit, procedure-oriented, and centralized style of university governance.
3. Tendencies toward centralization of union governance among faculties and student groups.
4. Further reductions in the autonomy of universities. Unions in seeking to bargain with the agency which holds the greatest decision-making power over resources will gradually draw legislative bodies into the milieu. These will then participate directly and systematically.
5. Greater emphasis on seniority and less on merit for the purpose of faculty promotions.
6. A general change in the nature of relations among faculty members. Collegial status arising from various forms of distinction will be replaced by tendencies toward egalitarianism.

Student demands. Universities today are operating in the wake of unprecendented levels of student activism. The Carnegie Commission on Higher Education (1971:103) observes that the universities in the United States in the 1960s and early 1970s experienced "the greatest turmoil in all their history of over three centuries."

Kristol (1970) sees the relative increase in student demands over the years as a result of two factors. The first is an indentity crisis. Students see their lives neatly planned for them. They see themselves as moving ahead in their careers in neat and orderly fashion. They feel alienated in that the need to strive to overcome problems has been largely denied to them. In making demands, then, they are attempting to establish an identity. The second factor is the over organization of society. Students, in making demands, are reacting to what they perceive as manipulation by society and by universities in particular. They tend to view society as a whole (including universities) as a game played by power elites for their own gratification. What they are demanding essentially is a greater degree of participation in the process to which they are bound.

Cowely (1980) predicts that student activism in the 1980s will take both "visceral" and "cerebral" forms and will continue to be recognized by university managers as a significant force in the operation of universities. This will be due in part to more clearly defined channels of communication.

Summary

This section has outlined some of the central trends in thinking as regards: (1) the characteristics of organizational environments, (2) organizations' responses to environment, and (3) the effects of environments on the operation of universities.

Environments, by and large, are regarded as significant to the operations of organizations. Authors generally see the environments of organizations as external to them and as constraining them in some way. Also, environments are viewed as subject to overall change in response to a number of factors. In order to survive organizations must maintain the capacity to respond to changing environmental conditions.

Universities are seen as operating in environments which are becoming increasingly uncertain and in which there is perceived to be an increase in hostility to the concept of continued university autonomy.

CHAPTER 3

Methodology and Research Design

This section provides a description of the design of the study and the research methods used. First, a general outline of the research design is given and the three main purposes of the study are explained. Following this the conceptual framework is presented. Three separate perspectives are combined in order to comprehend theoretically relations between environmental forces and university operations. Next a brief description of the respondents is given. Then an outline of the techniques used to gather and analyze data is presented. The collection of data proceeded somewhat according to the Delphi technique and data analysis was based on content analysis methods. Finally, some of the difficulties encountered in association with the Delphi technique are described.

Design of the Study

Focus of the Study

This investigation had three basic purposes. The first was to identify those environmental forces expected to have an impact on the operations of selected departments in the Science and Education Faculties at the Universities of Alberta and Calgary over the next five years. The second was to assess the possible effects of the forces on programs of study offered. The third was to list practical options available to departments for dealing with the problems expected in the area of program development. The departments involved were as follows: in the Faculties of Science, the Departments of Chemistry, Physics, and Geology; in the Faculties of Education, the Departments of Elementary Education and Educational Administration.

The study utilized a quasi-Delphi technique involving three separate rounds of questioning. Each round brought new material founded on that of the round before.

The study moved from the general to the specific. In the first session of data collecting respondents were asked to list whatever environmental forces seemed likely, from their particular positions, to have an influence on the operations of the departments in the coming years. Respondents were instructed to list any environmental force which they believed to be potentially significant. As a result of the first questionnaire, a list totalling 34 forces was obtained. In the second session of data gathering respondents were asked to rate each individual force for its likelihood of occurrence and also for its potential impact on admissions to study programs, the content of programs, and instructor/student interaction in programs. The results of the second questionnaire showed three dominant groups of forces. In the third round respondents were asked to outline in detail specific problems which they expect their departments to face in the next five years as a result of the action of those environmental forces thought to be dominant. They were then asked to outline their department's goals in the area of program development as well as practical means for achieving the goals.

Conceptual Framework

For the purpose of comprehending the environmental forces expected to have an impact on the functioning of the departments, the study combined Emery and Trist's (1965) theory of environmental types with the theory of the nature of environmental forces developed by Gibson, Ivancevich, and Donnelly (1979). Emery and Trist (1965) suggest that their Type 4 Environment (Turbulent) is that which is present today. Gibson et al (1979) place environmental forces which act on organizations into three categories: those arising from the dynamics of the marketplace, those relating to developments in technology, and those associated with political and social change.

The theoretical framework used for interpreting the relationships between the environmental forces and expected changes to study programs was that outlined by Meyer and Rowan (1978). They hold that the structure of an organization is a reflection of the organization's activity within a particular set of environmental conditions. As the environment changes so must an organization's formal structure. The subset of the overall structure of universities of concern in this investigation was the study programs offered by the selected departments.

The Respondents

Respondents were selected on the basis of direct administrative and professional experience in the departments studied. Table 1 shows the particular positions of the respondents contacted prior to the distribution of the questionnaires for Rounds I and II.

Before distributing the questionnaires for Round I, 16 individuals were contacted and asked to participate. Among them, four were deans of faculties, eight were department chairmen, two were senior professors of whom one was a former department chairman, and two were administrative officers. Prior to distributing the questionnaires for Round II 20 additional respondents were gathered. All were individuals occupying the position of professor in the various departments. The purpose of introducing this group into the study at the beginning of Round II was to increase the number of respondents after the relatively low rate of return of questionnaires for Round I. Data gathering for Round III involved personal interviews with five respondents. Three of these were department chairmen, one was an administrative officer, and one was a senior professor. The respondents interviewed in Round III were believed to have been among those who had taken part in both Rounds I and II.

Table 1

Positions of Respondents Contacted and Numbers of Questionnaires Distributed and Returned

	Positions of Respondents Contacted						
	Deans	Faculty Admin. Officers	Dept. Chairmen	Depart. Admin. Officers	Senior Professors	Number of Questionnaires Distributed	Number of Questionnaires Returned
Round I	4	1	8	1	2	16	8
Round II	2	0	4	1	21	28	25
Round III	Data gathering for Round III was carried out by interviewing selected respondents instead of distributing questionnaires.						

Data Collection and Analysis

Content Analysis

Principles of content analysis were used for the purpose of dealing with the data in this study. Content analysis is a broad term referring to a number of specific procedures for determining the significance of forms of communication. According to Deese (1969), content analysis is a collection of techniques for providing interpretations of communication data. Holsti (1969) sees content analysis as the application of systematic methods for the purpose of describing attributes of messages.

The purpose underlying the use of content analysis is explained by Carney (1979:17):

> Using [content analysis] you adopt an investigative frame of mind: instead of seeking facts to prove or disprove an hypothesis, you are simply recording details each in itself too insignificant for you to be able to see--and therefore be biased by--its meaning. Only when you have all the facts can you see which are emphasized most, which least; only when all the facts are in can you see what is not there.

So, in short, content analysis aims to be the antithesis of impressionistic reading and inferring.

The following, according to Carney (1979) are the procedures involved in carrying out a content analysis study:

1. Unitizing data. Unitizing means dismantling data into individual units for analysis. The procedure involves deciding on the boundaries of the units to be analyzed. Holsti (1969) observes that most content analysis studies use one of five units: the single word or symbol, the theme, the sentence or paragraph, the item or the character.
2. Categorizing data. This means sorting data units into categories in some logical way. Holsti (1969:95) suggests that categories should "reflect the purposes of the research, be exhaustive, be mutually exclusive, independent and be derived from a single classification principle."
3. Measuring content. Measuring refers to counting specific characteristics in the data. According to Holsti (1969:122), "The most widely used method of measuring. . .content is frequency, in which every occurrence of a given attribute is tallied."
4. Assuring reliability and validity. This refers to establishing soundness and consistency both with respect to conceptual constructs and in reference to replicability. Holsti (1969) suggests appropriate sampling techniques and rigorous statistical procedures in measuring as means to assuring reliability. He recommends interviewing or direct observation, where possible, as the most direct checks of validity.

Data Collection Procedures

As mentioned earlier, this study used a quasi-Delphi technique involving three separate sessions of data gathering.

The purpose of the first round was to assemble a list of environmental forces expected to affect the selected faculties and departments in the coming years. The questionnaire was made up of open-ended questions. Respondents were asked to outline environmental forces both inside and outside of the universities which they believe will be significant to the operations of their faculties and departments in the next five years. Respondents were also asked to state the reason for each force cited. Space for 15 responses was provided.

The package of materials for Round I contained a personal data sheet, a brief outline of the Delphi technique, the questionnaire itself including instructions and space for completion, and a list of some examples of environmental forces. The examples were taken from the literature. The purpose in including the list was to assist respondents in their thinking. Materials were distributed to 16 individuals in the Departments of Physics, Chemistry, Geology, Elementary Education, and Educational Administration at the Universities of Alberta and Calgary.

The purpose of Round II was to rate the environmental forces brought forward in Round I. Respondents were asked to consider each force, first of all, in terms of its likelihood of affecting their faculties and departments in the coming years and, secondly, for its likely impact on admissions to study programs, the content of programs, and instructor/ student interaction in programs.

The questionnaire for the second round contained instructions for completion, a list of the forces generated in Round I grouped according to type and scales for rating each force in terms of its likelihood of occurrence and its potential impact on admissions, content, and interaction. The scale for rating the likelihood of occurrence was made up of the categories: Very Unlikely, Not Likely, Likely, and Very Likely. Each of the three scales for rating the impact of the forces on study programs was made up of the categories: Negligible Impact, Low Impact, Moderate Impact, and High Impact.

Questionnaires were distributed to 28 individuals. Eight were respondents who had returned the questionnaire for Round I. The other 20 were gathered from the ranks of senior professors in the various departments involved in the study.

According to the results of Round II, three groups of environmental forces were predicted as likely to dominate the development of the faculties and departments in the coming years. The purposes of Round III were, first of all, to forecast specific problems expected in connection with the action of the dominant forces, and secondly, to outline goals for development held by the departments involved as well as practical options available for achieving the goals.

Data collection for the third round consisted of carrying out personal interviews with five respondents. Three of these were department chairmen, one was an administrative officer, and one was a senior professor. All respondents interviewed in Round III were believed to have been among those who had taken part in both previous rounds. Materials for Round III were given to respondents several days prior to the interviews.

Data Analysis Procedures

Analysis of the data for Round I involved unitizing respondents' remarks, sorting the resulting data units into categories, and assigning labels to the categories.

In unitizing the data, themes were taken as the unit of analysis. Each environmental force outlined was reduced to its thematic essence. Then the thematic units were sorted into categories. Finally, the categories were assigned labels consistent with the thematic units contained in them.

The environmental forces outlined in Round I were listed on the questionnaire for Round II by category.

Data analysis for Round II consisted of placing the environmental forces in rank order, noting those forces forecasted as most significant in terms of expected impact on study programs and comparing the responses given by representatives of the two faculties involved.

For the purpose of placing the environmental forces in rank order a frequency analysis was carried out. It focused on respondents' forecasts of the likelihood of each force affecting the faculties and departments in the coming years. As a means to noting those forces forecasted as potentially the most significant in terms of impact on study programs a second frequency analysis was done. This second frequency count focused on respondents' forecasts of the likely effects of each force on the three aspects of study programs involved in the study. And, in order to bring to light significant differences in responses between the two faculties represented in the study a t-Test was carried out.

In addition to these procedures, a Pearson Correlation Test was run in order to point out highly significant correlations among the variables. The results of the Pearson Test have been placed in the appendix.

The procedure used in analyzing the data for Round III somewhat resembled that used in Round I. First, the remarks made by respondents in the interviews were edited in order to reduce them to a collection of individual themes. Then, the themes were sorted into categories. In addition, comparisons were made involving the responses given by representatives of the two faculties involved.

Difficulties Encountered in Collecting Data and Departures from the Convention Delphi Method Taken

The methodology used in this study has been termed quasi-Delphi. The study was originally intended as a more or less conventional Delphi. However, problems relating to the assembly of data began to appear when fully one-half of the respondents who had agreed to participate failed to return the first-round questionnaire. As a result, the decision was taken to depart somewhat from the conventional Delphi method. Two main changes were made. First of all, in addition to distributing questionnaires for Round II to all participants who had returned the Round I questionnaire, 20 additional respondents were contacted and given questionnaires. The purpose of recruiting the additional respondents was to minimize possible reliability problems arising from what would otherwise have been a very small sample. Secondly, interviews were held with a number of respondents in lieu of distributing a third-round questionnaire. The interviews had two purposes. The first was to provide the opportunity to probe in depth the specific problems facing the departments as a result of the actions of the dominant environmental forces. The second was to guard against further opting out by respondents.

Although this study resembles a conventional Delphi only in part, it resembles other techniques currently available for futures forecasting even less. It was on this basis that the methodology was termed quasi-Delphi.

Difficulties relating to the collection of data have been experienced by other researchers using the Delphi technique. Barrington (1981), for example, had difficulty in motivating respondents to return questionnaires within a specified (reasonable) time.

Problems associated with the assembly of data can be said to constitute a serious disadvantage in the Delphi method. Delphi can be exceedingly difficult to apply in situations in which respondents are under no obligation to cooperate.

Summary

This section has presented an outline of the design of the study and the research methods used. The purposes of the study have been stated as, first, to identify the environmental forces expected to have an impact on the operations of certain selected departments at the Universities of Alberta and Calgary in the coming years, second, to forecast the possible impact of the forces on programs of study offered and, third, to outline practical options available to the departments for dealing with problems expected in the area of program development.

The conceptual framework of the study has also been described. The conceptual framework contains the theoretical perspectives used to interpret relations between environmental forces and the operations of faculties and departments.

Also, a description of the respondents has been given. Respondents were chosen on the basis of years of administrative and professional service in the various departments involved.

A description of the techniques used to gather and analyze data has been included. The study used a quasi-Delphi technique involving three separate rounds of data gathering. Analysis was carried out according to the principles of content analysis.

Finally, a brief section has been devoted to outlining some of the difficulties encountered in carrying out the study.

CHAPTER 4

Futures Forecasting and the Delphi Method

The purposes of this chapter are, first of all, to provide a general introduction to the emerging field of futures research and, secondly, to outline and discuss specific aspects of the Delphi method of inquiry which was adapted for use in this study. The Delphi method is considered in terms of its philosophical associations and general methodology. Following this, a brief section is devoted to the general applications of the method. The aim is to outline the kinds of problems for which Delphi is seen as suitable. Then the advantages of the method are discussed. Finally, the main criticisms of Delphi as brought forward by its two principal critics are considered as well as are some responses to the criticisms as they appear in the literature.

Overview

Although attempts to consider future environments according to academic rules have begun only quite recently, the practice of speculating about the future has shown itself over the centuries to be basic to the condition of mankind.

An interesting relationship between man's ability to predict the future and his capacity to create a future to his liking is pointed out by Shackle (1961). If the future were ever completely predictable then we would be at a loss with regard to creating a likeable future for ourselves. If we could predict a particular catastrophe with certainity, then there would be no way of preventing it. However, if the future is composed of any number of possible alternatives then we may be able to intervene and make the occurrence of one set of events more likely than the occurrence of another set. In other words, we can influence the future only if the future is not fixed at any point in time.

At this point, consideration is given to the general philosophic and methodological guidelines which apply to the field of futures research.

Cornish (1977) outlines what he believes are the emerging principles underlying futures research. The first is an adherence to the holistic view of nature. According to the holistic perspective, the world (including man) exists as "one piece" rather than as an aggregate of independent units. This emphasis on the interconnectedness of everything leads one immediately to the realization of the impossibility of understanding any aspect of reality (whether object or event) without considering its place within the whole. This adherence on the part of futures researchers to the holistic view of nature may be the cause of a good deal of the conflict between futurism and at least some branches of conventional science which tend to view the world atomistically.

The second principle of futures research is an overriding awareness of the passage of time. Unlike other disciplines which are almost totally preoccupied with immediate problems and their effects, futures research insists on making potential problems an integral part of day-to-day decision-making. Cornish (1977) presents the following example in support of this: An increase of two percent per year in air pollution may not attract significant public attention in light of the many other serious problems confronting individuals from day to day. However, such an increase would mean that air pollution would double in a mere 34 years! In operational terms, this awareness of the passage of time means identifying and monitoring gradual changes so that appropriate action can be taken and crises can be avoided.

The third principle of futures research, according to Cornish (1977), is that the future--what researchers are actually trying to study--does not exist. That is to say that the future must somehow be invented. What might happen at some future time must be conceptualized before it can be studied. Images of the future can only be represented in the form of ideas. Thus, ideas of the future are vitally important because all analysis and speculation is shaped by them. Also, to the extent that man is able by choosing certain programs of action over others to create his future the future can be shaped by our mere speculations about it.

Olaf Helmer (1978), a pioneer in the field of academic forecasting, views futures research primarily as a tool to be used by decision-makers. The function of forecasting he suggests should be to provide decision-makers with information and analysis regarding future environments so as to facilitate better decision-making. Thus, Helmer (1978) sees futures research as mainly pragmatic. His hope is that by forecasting aspects of future environments and by exploring alternative methods of operating the result can be an improvement in decision-making.

In connection with his view of the generally pragmatic nature of forecasting Helmer (1978) regards the methodology of futures research as pre-scientific. The two important factors here are the urgency of obtaining information in most futures research projects and the fact that no observable data exist on the nature of future environments.

Regarding the matter of the urgency of most futures research tasks Helmer (1978:765) states:

> The urgency of the task--whether it be the conduct of military operations, the management of the energy crisis, or the search for cures for our sick society--is so great that we do not have time to construct neat scientific theories which would permit us to identify the optimal plan of action to be followed. Instead, ... the futures researcher constructs ad hoc models as best he can, well knowing that they be imperfect and will have to be corrected and improved as more data are obtained and more experience is accumulated.

In addition to the need for urgency in futures research there is also the problem that no data based on direct observation exist. This means that researchers are bound to rely on soft, judgemental data. In view of this fact, Helmer (1978) argues that the intuitive judgement of experts is a necessary ingredient in the process of futures research. He suggests that in order to maximize the use of experts they should contribute to all aspects of futures research projects: supplying judgemental data, constructing and evaluating models, and developing programs of action.

In connection with this, Helmer (1978) points out that some forecasting methods generate data which appear similar to those generated in the conventional sciences, i.e., highly quantified. This is usually done by requiring respondents to submit probablistic pronouncements regarding future environments. Such data must still, however, be recognized as judgemental.

At this point the discussion moves to one particular forecasting technique: the Delphi method.

Delphi

The Delphi technique was originally developed in connection with a defense research project of the United States Air Force. The first outline of the method aimed at individuals outside of the defense community was presented by T.J. Gordon and Olaf Helmer in 1964. Since then use of the method has mushroomed. Today, in addition to the use of Delphi by the military it is also commonly used in industry, government, and academe.

Delphi Methodology

Linstone and Turoff (1975:3) see the Delphi technique as "a method for structuring a group communication process so that the process is effective in allowing a group of individuals as a whole to deal with a complex problem."

A conventional Delphi study in its simplest form proceeds somewhat as follows (Weatherman and Swenson, 1974):

- A number of experts representing a particular field are asked to provide written responses to questions on some topic. The responses involve making intuitive judgements. The responses are made individually without consulting colleagues.
- The initial questionnaire is distributed to the respondents. This first questionnaire represents a "needs assessment" of the topic. After the questionnaires have been completed by the respondents they are returned to the researcher.
- The researcher analyzes the results of the questionnaire and from them develops a second questionnaire. The second questionnaire contains a summary of the results of the first questionnaire. Respondents are asked to study the summaries of results and reconsider their answers. In instances where respondents revise answers they are asked to state the rationale for the new responses. After completion, the questionnaires are returned to the researcher.
- The researcher analyzes the results and prepares a third questionnaire. This questionnaire contains summaries of the results of the second questionnaire. The third questionnaire is distributed to the participants. As with the second questionnaire, participants are asked to study the summaries and reconsider their answers. If they revise their answers they are again asked to supply the rationale for doing so.

This procedure may be carried on through further rounds of questioning until some degree of concensus among the respondents is reached.

Philosophy of Delphi

A study of basic Delphi philosophy should accompany any attempt to understand the outward practices associated with the technique. This is necessary not for reasons of pure interest but for practical reasons. As Mitroff and Turoff (1975) point out, each philosophy gives rise to a characteristic set of research procedures. This is because each philosophy views the world in a unique way -- in a way which is characteristically distinct from other philosophies. Each philosophy, by merely existing, claims that its own way of interpreting reality is closest to the true way. In connection with this, each philosophy prescribes that researchers claiming to adhere to it make certain assumptions about the nature of reality and follow certain more or less clearly defined procedures in investigating aspects of reality. Thus, the particular philosophy upon which any research procedure is founded is of fundamental practical importance for researchers and is not merely of "philosophical" interest.

Mitroff and Turoff (1975) in discussing the philosophical associations of the Delphi method link it most closely with the systems of inquiry of Locke, Kant, and Hegel. For the purposes of describing the philosophical associations of Delphi here, let us summarize briefly the systems of inquiry in question and at the same time review Mitroff and Turoff's (1975) account of the association of Delphi with each system.

Locke's system. The inquiry system developed by Locke operates empirically and inductively. Data are regarded as preceding theory and function basically to support or justify theory. The researcher operating within the framework of Locke's system of inquiry begins with essential judgements, e.g., sensations, and constructs increasingly general networks of facts about the world. The only essential judgements which can be accepted as bases for such networks of facts are those which are directly observable. Thus, according to Locke's system, truth is experiential. The reality of any phenomenon can best be explained through an empirical analysis of its contents (Locke, 1969).

The validity of a fact generated by this inquiry system is a reflection of the degree to which it finds acceptance among experts. An empirical generalization can be considered "factual" if there is general agreement among those accepted as experts that it is so.

Mitroff and Turoff (1975) suggest that the Delphi method in its conventional form is a classic example of a Lockean inquiry. In a conventional Delphi study tens or even hundreds of respondents are asked to "vote" on when they believe a certain event will occur. After the responses are collected the data are summarized and returned to the respondents along with another questionnaire. Several rounds of questioning follow in which the respondents are encouraged to move to a consensus of opinion. According to Mitroff and Turoff (1975), the links between conventional Delphis and the Lockean system of inquiry are: (1) the idea that a large number of experts is required to treat adequately any proposition, (2) the practice of considering the initial responses as essential judgements, and (3) the notion that consensus among the respondents represents agreement among experts.

Kant's system. The system of inquiry formulated by Kant stresses the need for a synthesis of the empirical and the theoretical aspects of inquiry. Neither data nor theory is given priority. Theory and data are regarded as inseparable. Research, from this perspective, begins with the assumption that there already exist bodies of theory and data on the phenomenon in question even if these appear only in informal ways (Goldmann, 1971). In the actual practice of research this approach leads to the formulation of ranges of theories and models of systems. The function of each combination of theory and data is to explain with greater explicitness and precision than all others the operation of a system or some part of it.

The validity of the results of research carried out from the Kantian perspective is the measure of the "fit" between theory and data. The validity of a model constructed from a Kantian inquiry, for example, is the degree to which it matches empirical reality and also the degree to which it shows that each observation carries its own characteristic theory.

Mitroff and Turoff (1975) point out that whereas most early Delphis tended to emphasize consensus among a group of experts with respect to some issue, some more recent work has taken the form of examining an issue and bringing forward alternatives in relation to it so that a comprehensive overview can be formulated. They suggest that Delphi inquiries which have as their purpose to elicit alternatives in this way can be considered to represent the Kantian system of inquiry.

Hegel's system. Hegel's system of inquiry holds truth to be the final result of the continuing exchange between thesis and antithesis (Stace, 1955). Diametrically opposing sides deliberately engage each other in debate about the correct nature of a system. Through a continuous contest between the sides contradictions which distort the reality of the system are gradually removed. Out of this debate is thought to emerge a reconciliation between the sides as contradictions diminish. The eventual result, then, appears as a systhesis of thesis and antithesis. This systhesis (free of contradictions) represents the true nature of the system.

Research carried out by each side in the contest begins from characteristically opposing assumptions and views. Thus, data, in the context of the Hegelian system, has no function other than to support the assumptions and views of the opposing sides.

According to Mitroff and Turoff (1975) the Hegelian method of inquiry represents the base for the Delphi variation which has been labelled "Policy Delphi." "In the Policy Delphi the communication process is designed to produce the best underlying pro or con arguments associated with various policy or resource allocation alternatives" (Mitroff and Turoff, 1975:31). In these studies experts representing opposing perspectives are asked to present arguments in favour of their perspectives. The aims are (1) to uncover areas of common understanding and (2) to generate agreement on points of conflict as a result of ongoing debate.

General Applications of Delphi

The basic Delphi technique has over the years been modified in a number of ways for the purpose of applying it to a range of practical problems. As a result, several general types of Delphi applications have been noted. Linstone and Turoff (1979) outline five general types: (1) a forecasting tool, (2) a communications system for policy questions, (3) a device for stimulating and educating decision-makers, (4) a device for outlining environmental trends, and (5) a method for assessing the level of risk associated with a certain undertaking.

As mentioned earlier, Delphi originated as a forecasting tool for problems in military development. Since the early years the technique has been expanded to apply to a wide range of problems involving forecasting in both the public and the private sectors.

As a communications system for policy questions Delphi is used to structure interactions relating to goal-oriented problems. Resolution of such problems involves exchange between advocates of differing forms of action. It means bringing to light areas in which agreement can be reached. It facilitates compromise in areas containing advocates of differing goals.

Delphi as a device for stimulating and educating decision-makers functions to make decision-makers aware of the ideas of others. First, it brings the ideas of other informed individuals into focus for sometimes isolated decision-makers. Then, it forces decision-makers to reflect on a particular problem in light of these ideas.

As a device for providing information on environmental trends Delphi is used by planners in both the public and private sectors.

Delphi is also sometimes used for assessing the degree of risk involved in a particular undertaking. In government, for example, decisions must often be made regarding the effects of a proposed program without adequate information. The cost of a new program may be grossly underestimated if planners fail to account for the nonlinear behaviour of environmental elements. In such instances the Delphi technique may provide useful information.

Linstone and Turoff (1979) are careful to point out that it is not always the specific nature of the problem itself which determines whether or not the Delphi technique is appropriate. Instead, what may be significant are the circumstances which characterize the group communication. In connection with this point they present a list of characteristics of problems and group communications processes for which the Delphi technique is appropriate. These can be summarized as follows:

- Problems not suited to conventional analytic methods but which may benefit from intuitive analysis.
- Individuals who may be able to shed light on a problem but who have no history of adequate communications or who represent diverse backgrounds.
- More respondents are required than could interact effectively in group meetings.

- Time and cost limitations make group meetings impossible.
- The heterogeneity of the participants should be preserved to avoid the "group think" effect.

Some Recent Delphis in Post-Secondary Education

In the last number of years the Delphi technique has proven useful to researchers in the areas of policy making and the development of post-secondary institutions in Alberta. The results of these studies as well as resolving conceptual or situational questions have underlined the utility of the Delphi method for certain kinds of research problems.

Berghofer (1972) examined the impact on educational policy makers of exposure to material taken from the field of futures research. The study involved students in educational administration study programs. Three groups of students were defined. Treatment involved exposing the groups to different amounts of material taken from the field of futures research. Each group was then asked to make judgements about key policy statements relating to education in Alberta.

Results showed that the group with the greatest level of exposure to the material had the greatest tendency to reject the policy statements and present alternative statements while the group with no exposure had the greatest tendency to support the policy statements and extrapolate the detail contained in them for the purpose of addressing possible future problems.

Besides pointing to the need for a futures orientation among policy makers, Berghofer's (1972) study demonstrated the value of Delphi as a tool for facilitating interaction among decision-makers in the process of developing educational policy.

Konrad et al. (1976) studied middle-level administrators in two-year post-secondary institutions in western Canada for the purpose of assessing their professional development needs. The study also examined relationships between professional development needs identified and personal characteristics, professional backgrounds, and employment situations of the administrators.

Results indicated that the most significant professional development needs were instruction in planning and evaluating programs and motivating staff. The study also provided a clear picture of the relationships between individuals and expressed needs.

Needs assessments such as this one represent an essential step in the construction of sound educational policy.

Barrington (1980) identified and explored some of the environmental forces likely to have an impact on the operation of community colleges in Alberta in the years 1980-1990. The study involved two groups of experts in the field of post-secondary education. One group consisted of the presidents of most of Alberta's community colleges. The other was made up of senior officials in the Department of Advanced Education and Manpower.

The study outlined 16 environmental forces likely to be significant to the operation of the community colleges in the next decade. Economic and political forces were judged as most important by the respondents with demographic forces rating third. The impact of the forces was forecasted as likely to be manifest in increasing calls for flexibility and accountability on the part of the colleges.

Barrington's (1980) study outlined the value of Delphi as a tool for communications between diverse groups.

Advantages of the Delphi Method

The body of literature relating to the Delphi technique is growing steadily as increasing numbers of studies which use it are carried out. There are emerging in this literature a number of advantages of Delphi some of which seem to be unique to it.

Perhaps the primary advantate of Delphi (judging by the number of authors who have noted it) is that it affords respondents a high degree of freedom from restrictions in relation to their responses. Linstone and Turoff (1975) discuss this point in terms of the method's tendency to minimize extraneous nonverbal communication among respondents which may function to decrease an individual's capacity to express independent judgements. Lanford (1972) goes a step further in suggesting that the value of anonymity lies in reducing the influence of specious persuasion associated with group meetings which may function not only to reduce an individual participant's capacity to express independent judgements but also to form them in his own mind.

A second important advantage of the Delphi method according to Linstone and Turoff (1975), is that it is relatively cost efficient. Delphi utilizes the expertise of the participants without the need for face-to-face meetings which may be infeasible due to time or financial restraints.

Another advantage of Delphi, according to Barrington (1981), is more effective research results. Through controlled communication researchers are able to focus more rigorously on the problem than would be the case if participants met face-to-face. Thus, there is generally greater simplicity and clarity with respect to analysis of the issues in question. Lanford (1972:22), in connection with this point, states that, "Research suggests that face-to-face discussion tends to make ... group estimates less accurate whereas the controlled-feedback procedure makes group estimates more accurate."

As a fourth advantage, various authors, e.g., Weatherman and Swenson (1974), Linstone and Turoff (1975), and Barrington (1981) point to the method's pedagogical value for participants. Even Weaver (1971:270), one of Delphi's most vehement critics, agrees with this. "Delphi in combination with other tools is a very potent device for teaching people to think."

A Critique of Delphi

The main critics of the Delphi method to date are Weaver (1970; 1971) and Sackman (1975). Both have aimed their assessments of Delphi at the conventional form of the method. For the purpose of appreciating fully their criticisms let us recall that conventional Delphis (of the early years) typically showed the following characteristics: they attempted to find a precise answer to a question; they attempted to force a convergence of opinion among respondents, and; they required only outliers to provide a rationale for their responses.

The criticism of Delphi brought forward by Sackman (1975) and Weaver (1970; 1971) can be reduced to the following points: (1) Delphi's reliance on the opinion of experts is unjustified, (2) attempts to achieve a convergence of opinion among respondents is dysfunctional, (3) suppression of adversary relations is inhibitory, (4) questioning techniques and the responses they generate are inadequate, and (5) Delphi's researchers lack prevision in reporting results. Let us examine each point in turn.

Sackman (1975) questions the validity of the concept of expert. He argues that--at least in regard to "complex social phenomena"--investigators have not been able to demonstrate substantial differences between experts and nonexperts. He further argues that panels of experts chosen in "unspecified" (unscientific) ways may increase the likelihood of contaminated samples. He, therefore, concludes that the emphasis which Delphis typically place on the opinion of experts is unjustified.

Both Weaver (1970) and Sackman (1975) object to the practice of forcing a convergence of opinion among respondents. They suggest that this, in effect, rewards conformity and penalizes individuality. (In some early Delphi studies only extreme outliers were asked to give reasons for their responses. Those respondents whose answers were nearer the median were "rewarded" by not having to justify their positions. Some recent Delphis have addressed this problem in one of two ways. Either they have required all respondents to provide the rationale for responses or they have disregarded the original goal of a high degree of convergence in responses.) Weaver (1970) and Sackman (1975) also suggest that the practice of forcing a convergence of opinion among respondents can result in steering respondents away from unexplored and potentially useful domains in relation to the research question.

Weaver (1970) and Sackman (1975) also object to what they regard as Delphi's systematic suppression of adversary relations among respondents. In the words of Sackman (1975:54):

> Delphi deliberately factors out face-to-face confrontations and the adversary process associated with it, as one of its prime philosophical tenets justifying consensus. Arguments are filtered buffered, and effectively neutralized in Delphi.

Weaver (1970) and Sackman (1975) also argue that the suppression of adversary relations inhibits the exploration of ideas. Free exploration most often leads to argument and adversary relations and it is precisely these that need to be explored in order to open up new dimensions in relation to a problem.

As regards Delphi questioning techniques and responses to questions, Sackman (1975) holds that both are inadequate. According to Sackman

(1975), what Delphi questions typically represent are generalized descriptions of possible future events which permit a respondent to project any possible scenario as his interpretation of the event. He insists that future events do not lend themselves to being described clearly in the one-sentence style common to the Delphi format. In short, the imprecision common to Delphi questions leaves too much up to the interpretation of the respondent.

Regarding Delphi responses, Sackman (1975) holds that these are typically ambiguous. He suggests two reasons for this. The first is the fact that the questions themselves are ambiguous inviting ambiguity in answers. The second is that respondents in most Delphi projects answer questions without sufficient reflection. Sackman (1975) believes that most Delphi responses represent "top-of-the-head opinion." As a result of this, Delphi responses generally reflect stereotyped thinking. To illustrate the point Sackman (1975:60) quotes from a study by Nanus, Wooten, and Borko (1973):

> "This technology is essentially here already, so I'll forecast early"; or "utopian dreamwork, so I'll forecast never"; or "costs are much too high--appear later"; or "no one cares, the public won't buy it"; or "this is a trivial advance"; or "this will kill scientific progress"; or "people will rebel against this invasion of privacy."

In short, Sackman's (1975) suggestion is that the tendency for respondents in answering Delphi questions is to make snap judgements couched in catch phrases instead of pondering questions until real insight appears.

Lastly, Sackman (1975) decries what he sees as the lack of precision in the reporting of most Delphi results. He contends simply that forced concurred judgement on the part of experts is a poor substitute for the precision that characterizes some other forms of inquiry. Included here are factors such as measures of the validity and reliability of questionnaire items, estimates of the probability of the occurrence of future events, and systematic treatment of outliers.

As a final note, both Weaver (1970) and Sackman (1975) allude to the thought that Delphi is not rigorously scientific. This is done by decrying the absence of statistical precision, the absence of precision in the construction of questionnaires, and what Sackman (1975) considers generally slipshod behaviour on the part of both respondents and investigators alike perpetrated by the essence of the technique itself.

A Refutation

These criticisms have prompted responses from several authors. The responses, like the original criticisms, are wide ranging and vary from a basic acceptance of the critical points with ideas on how they may be overcome in future Delphis to an outright condemnation of them. One author (Goldschmidt, 1975) even goes as far as to suggest that Sackman's (1975) critique probably arose from some secret political motive.

Questions of the validity and reliability of Delphi studies are legitimate, according to Hill and Fowles (1975), and should be addressed. These authors see challenges to the validity of Delphis arising from pressure for convergence in responses. Pressure applied by researchers with the aim of forcing respondents to arrive at similar answers, Hill and Fowles (1975) believe, is the primary factor in undermining the validity of Delphis. Threats to the reliability of Delphi applications are likely the result of the lack of standardization in the research procedure. Hill and Fowles (1975) suggest that difficulties of reliability are solveable through a high regard for precision in the execution of a study.

Coates (1975) considers Sackman's (1975) critique of Delphi an "attractive irrelevancy." He suggests that Sackman (1975) has missed the point completely in failing to realize that Delphi is not a tool of survey research. Furthermore, according to Coates (1975), Delphi is not in any way related to scientific experimentation or the scientific structuring of activity. Delphi is not merely another way of "doing science." In the words of Coates (1975:193):

> Our world is fractionated by disciplines, organized in bureaucratic lines, divided in authority and responsibility, plagued by a polyglot technical language, polymorphic in its organizational structure and constantly butting up against issues that overflow and exceed authority, competence, responsibility, and disciplinary categories and insights. We face a crisis of concepts, ideas, alternatives, diagnoses, foresight, and planning. Delphi is an attempt to deal with all of that.

Goldschmidt (1975) insists that Sackman's (1975) critique is neither a systematic nor an objective evaluation either of the Delphi method or of most of its applications. Beginning from what he considers Sackman's

(1975) misleading representation of studies, assertions for which there is no evidence and conclusions based on unwarranted inference, Goldschmidt (1975) concludes that the purpose for Sackman's (1975) critique was probably political rather than scientific. Goldschmidt (1975) goes on to suggest that the fact that Sackman's (1975) critique is a RAND publication may diminish RAND's reputation for producing professionally acceptable work.

As a final note to this section, let us consider Brockhaus and Mickelsen's (1977) survey of the trends in Delphi research. Brockhaus and Mickelsen (1977) found that the Delphi method has been used primarily in applied research and has proven to be most successful when used for forecasting and planning purposes. They also note that traditionally the Delphi method was most frequently used in the physical sciences and engineering although trends toward its frequent use in the social sciences, public administration, and education are emerging. Brockhaus and Mickelsen (1977) also report that the method was generally perceived as most helpful for the purpose of supplying information which would be used along with information gathered by other methods.

Summary

This chapter has provided an overview of the field of futures forecasting and an introduction to the technique of Delphi research. The Delphi technique has been considered in terms of its philosophical associations and its overall methodology. Delphi has been shown to relate closely to a number of legitimate systems of inquiry.

Some important applications of the Delphi method have also been discussed. Delphi has been shown to be a useful tool in the areas of futures research and policy development.

Finally, the principal criticisms of the Delphi method have been outlined. These include criticisms of the techniques used in selecting respondents, soliciting responses, and reporting results. Also, some space has been given to refutations of the criticisms as they appear in the literature.

CHAPTER 5

Environmental Forces and the Development of University Study Programs in Alberta: With Notes on the Theory of Program Change for the Future

This chapter has two main sections. In the first, the development of the structural elements in Alberta's universities involved in setting up and delivering study programs--mostly faculties--is traced from the early days. In addition, the environmental forces significant to the development of the universities at each period in their history are pointed out. The first section is not intended as a complete history of university development in Alberta. The purpose is not to catalogue the evolutionary stages of each particular faculty or program of study but is, instead, to provide a general outline of some of the important factors acting on the universities over the years and the results in terms of general trends in program development.

At the conclusion of the first section the point that universities should formulate proposals for future development is made. Future study programs is taken as an example of an area in which proposals could be constructed.

In the second section theoretical perspectives on program reform are presented. The purpose is to summarize some current theory of curricular reform for its potential application in planning program change.

Environmental Forces and the Development of Universities

Early Years: 1908-1945

Provincial support has played a key role in the development of universities in Alberta from the beginning. The establishment of a university for Alberta was a matter of high priority for the government in the early days. In 1906 the first session of the legislature in Edmonton passed an act to authorize the setting up of The University of Alberta (The University of Alberta, 1982).

Classes began in 1908 with an enrollment of 45 students. A period of rapid expansion followed. In the years 1908-1914 enrollment increased to 439. During these years the Faculties of Arts and Science, Law, Extension, Applied Science, and Medicine were established (Berghofer and Vladicka, 1980).

World War I slowed the pace of growth of the physical structure of the University but the expansion of programs of study continued. By 1918 the University had added the Faculties of Agriculture, Accounting (later Commerce), Pharmacy, Dentistry, and Household Economics (The University of Alberta, 1982).

After the war the rate of expansion of the University increased. By 1929 enrollment had reached 1,560. During these years several new buildings were added. In 1928 the School of Education (later the Faculty of Education) was established. Also, the curriculum was revised and expanded so as to allow students greater freedom in their choice of courses (The University of Alberta, 1982).

The environmental forces most significant to the operation of the University during the earliest years were the financial support and general encouragement from the government and the support in terms of enrollment in programs of study from the public at large.

The 1930's was a period of retrenchment for The University of Alberta. According to Berghofer and Vladicka (1980:9):

> The depression which began in 1929 put a stop to the program diversification and campus development of the 1920's. Between 1931 and 1937 the University's operating budget decreased. . .and did not regain its 1931 level until 1941. As a result, few new programs and no new construction projects were undertaken during the 1930's. In 1933-1934 a particularly serious reduction in the government appropriation for the University made tuition increases, staff reductions, and some salary cuts necessary... [However,] despite the retrenchment necessitated by reduced government support modest expansion took place in certain fields and the University continued to attract a growing number of students.

Total enrollment moved from 1,560 in 1928 to 2,327 in 1939 (The University of Alberta, 1982).

World War II brought vast economic and social forces to bear on the University. The most significant were shortages of qualified people in medicine, dentistry, and education, a high demand for both war-related research and special courses for armed forces personnel, and a significant decrease in the number of full-time students (Berghofer and Vladicka, 1980).

The effects of these forces in relation to the development of study programs were both temporary and permanent. Among the temporary changes relating directly to programs of study offered were the introduction of accelerated programs in medicine, dentistry, and education and the provision of special courses for armed forces personnel. The most important permanent development for the University was the establishment in 1945 of a branch of The University of Alberta in Calgary. Initially the Calgary branch consisted of only the Faculty of Education. However, within a few years, due to the demands for graduates in many fields, the government became committed to the development of a full university in Calgary (Berghofer and Vladicka, 1980).

Also in 1945 the University accepted sole responsibility for the training of teachers in Alberta (The University of Alberta, 1982).

Years of Rapid Expansion: 1946-1969

With the end of World War II the University of Alberta (and later The University of Calgary) entered a period of exceptional growth lasting until 1969. Enrollment in the years 1944-1948 went from 2,023 to almost 5,000. In the years 1949-1955 enrollment increases again were slower but from the mid 1950's to 1969 enrollment at the University of Alberta more than tripled going from approximately 5,000 to 17,500. Enrollment at The University of Calgary (which received full university status in 1966) during these years increased by more than ten times going from 400 to approximately 4,100. In addition, in order to deliver university education to the southern most region of the province The University of Lethbridge was established in 1967. In the first year of its operation it showed an enrollment of 638 students (Berghofer and Vladicka, 1980).

The enrollment increases experienced by the universities during this period of rapid growth were accompanied by government financial support which grew in direct proportion to them. The framework for financial support beginning in 1964 was basically a formula by which a university received a grant for capital development determined by its number of full-time students (Berghofer and Vladicka, 1980).

The effects of this expansion on the development of study programs were wide-ranging. In 1957 the Faculty of Graduate Studies was established at The University of Alberta and in 1963 the Faculty of Arts and Science was divided. The University of Calgary experienced the most spectacular growth during the years of rapid expansion. A branch of the Faculty of Arts and Science of The University of Alberta opened in 1951 and by 1960 full degree programs in Arts and Science were offered. Between 1963 and 1965 the Faculties of Engineering, Education, and Graduate Studies were established (The University of Calgary, 1983).

During the late 1960's the universities continued to expand. Between 1967 and 1970 enrollment at The University of Alberta increased by 40 percent and at The University of Calgary by 85 percent (Berghofer and Vladicka, 1980). At The University of Calgary between 1967 and 1970 the Faculties of Fine Arts, Management, and Medicine were set up as were the Schools of Nursing, Physical Education, and Social Welfare. In addition, the Faculty of Arts and Science was divided (The University of Calgary, 1983). The University of Lethbridge, established in 1967, offered programs in Arts and Science and Education (The University of Lethbridge, 1982).

In short, the years between 1945 and 1969 were marked by spectacular growth in all aspects of universities in Alberta including programs of study. Expansions were financed by government grants which were tied to student numbers.

Recent Years: 1970-1983

In 1971 Alberta's universities experienced their first decrease in enrollment in twenty years. This represented the beginning of a trend toward slower growth which lasted until the late 1970's. This fact combined with a desire on the part of the government for greater fiscal restraint led in 1976 to the end of the per student formula for university financing. It was replaced with a system of grants which provided for incremental increases on a base budget (Berghofer and Vladicka, 1980).

In the words of Berghofer and Vladicka (1980:53):

> [T]he 1970's was a period of restraint in educational funding. To maintain a high quality of service institutions were encouraged to streamline their operations, reallocate funds, and reassess their priorities for development and eliminate marginal programs.

As a result of government policies of fiscal restraint, two significant trends appeared in university development. The first was the elimination of some "marginal" programs. The second was a move toward the concept of university education as manpower training. Evidence for the emergence of this latter trend can be seen in the following statement (Berghofer and Vladicka, 1980:60):

> [Recent] funding procedures aim to control overall government spending on post-secondary education while encouraging development of services for which particular demand exists or which can stimulate economic or social development in the province.

Notwithstanding government policies of fiscal restraint and a basic change in the formula for funding universities, programs of study in the 1970's continued to expand. Although the expansion of study programs at The Universities of Alberta and Lethbridge were marginal, the growth which occurred at The University of Calgary was notable. In 1972 the Faculty of Environmental Design began operations. In 1975 the Schools of Physical Education, Social Welfare, and Nursing became Faculties. In 1976 the Faculty of Law was established and the Faculty of Arts and Science was divided into the Faculties of Science, Social Sciences, and Humanities. Also in 1976 the University College (later renamed the Faculty of General Studies) was established (The University of Calgary, 1983).

In 1978 Athabasca University came into existence. With extension programs offered to adult students at a distance Athabasca University brought undergraduate education within the reach of people unable or unwilling to attend any of Alberta's conventional universities (Athabasca University, 1983).

In the early 1980's Alberta's universities face a new challenge. Enrollments again are on the increase but government policies of fiscal restraint remain in place. The result, at present, is a strain on the universities' resources.

The Future

The 1980's may well represent a critical period for Alberta's universities in that it may be the period in which they will be forced to come to terms with the problem of balancing services offered with levels of financial assistance provided. The government's position on the issue is summarized by Berghofer and Vladicka (1980:60): "The tension that exists between...limits versus new initiatives, will be the touchstone of provincial policy on post-secondary education in the future." With this in mind, it seems reasonable to suggest that some basic changes are in store for Alberta's universities in the coming years.

One of the tasks of the universities at the present time should be to bring forward realistic proposals for their continued development. The ideas which they outline, bearing in mind the limits within which they will be forced to operate, could contribute significantly to the tone of their development in the next several years and ultimately could set the stage for their emergence into the twenty-first century.

The area of study programs is one in which universities could provide useful ideas for development. At this point the focus of the discussion moves to an examination of some theoretical perspectives on university curricular reform. The purpose of this section is to outline current thinking regarding ways in which programs of study could be shaped to meet the needs of the future.

Theoretical Perspectives on Program Reform

Most theorists in the area of university curricular reform view the necessity for change as arising from changes to either external or internal environments of universities. Cross (1975:56) believes that because universities opened their doors to a more diverse collection of students in the last number of years they must now reform curriculums so that learning experiences can be maximally effective "not for the average student, but for each student." In order to maximize the effectiveness of learning experiences on the individual level Cross (1975) advocates developing programs of study which are student-centred. Such programs would make provisions for individual differences in learning rates, life situations, and goals. Programs would be tailored to the particular needs of individual students.

Boaz (1980) suggests that curriculums in universities have come to reflect the lower academic standards common today. The gradual lowering of standards Boaz (1980) sees as a direct result of shabby student recruiting practices, the lowering of admission requirements, financial aid for students representing minority groups, grade inflation, laziness on the part of instructors, and other laxities. She recommends what is essentially a program of management by objectives in which the goal of academic excellence would take high priority.

Kennan (1979) and Leftwich (1981) see university curriculums as having become overspecialized. Kennan (1979) suggests that overspecialization begins at the level of undergraduate study and continues at all levels of scholarship. The difficulties resulting from this are a narrowing of individual scholarship and the isolation of study programs. Kennan (1979) suggests that although accrediting agencies must accept a portion of the blame for this much of the blame must rest with the universities themselves which have tended generally to divide themselves into ever more specialized segments. In order to overcome this problem Kennan (1979) recommends the implementation of multidisciplinary programs of study.

Leftwich (1981) suggests curricular reform involving the introduction of what he calls "the problem-solving approach." This would mean presenting students at all levels and in most disciplines with a realistic problem which they would work toward solving with the aid of the resources of the university. The effects of this approach, according to Leftwich (1981), would be twofold. First of all, it would cause a rise in the level of academic standards. Secondly, it would encourage multidisciplinary study and thus guard against even greater degrees of academic fragmentation.

Lipson (1975) sees a need for an advanced education system which transcends the limitations of the campus model. He envisions advanced communications technology applied to form an Open University Network. This organization, according to Lipson (1975), could operate on either the interstate or the national level.

Keller (1978) points to what he sees as the overcommitment to the positivist theory of knowledge found in most liberal arts courses today. Instructors typically convey very clearly to students the message that the knowledge associated with their particular discipline or area of concentration has come to light through the rigorous application of principles of scientific objectivism. The authority arising from this, according to Keller (1978), is overpowering in the context of the classroom setting and can function to retard students' abilities to think critically and openly. Arguing from the perspective of the sociology of knowledge Keller (1978) observes that theories, regardless of the discipline in question, are never objective or value-free but are necessarily contaminated by theorists' assumptions and biases. He concludes by stating that the distinction between science and myth is not clear-cut and normal scientific theory is invariably influenced by propaganda, prejudice, and vested interests. In order to correct the current imbalance in the orientation of liberal arts programs Keller (1978:42) calls for the restructuring of courses such that they are continually aiming "to reveal the ideological assumptions underlying particular viewpoints and to point out clearly that there is more than one viewpoint and more than one ideology."

According to Axelrod (1968), curricular change, in order to be effective, must involve more than merely introducing variations in the content and style of courses. Axelrod (1968) differentiates between six elements in any program of study: content, schedule, certification, interaction, student experience, and control. The first three are structural elements in that they are determined by the faculty within the framework of the rules of the university as a whole. The second three refer to conditions under which the structural elements operate. The ways in which persons and groups interact, the backgrounds of students, and the level of control (or freedom) possible in learning situations all influence the ways in which the structural elements can be applied. In order for changes to study programs to be effective they must involve changing the sum total of experiences given to students in the pursuit of their educational objectives.

Program Change in Practice

Authors on the subject of the process of university program reform suggest that it is a gradual phenomenon and one which is achieving varying degrees of success among different faculties as well as between institutions.

Hefferlin (1969) believes that under normal circumstances accretion and attrition together make up the main process of academic change.

Additions or subtractions of courses and programs to existing structures are carried out in slow incremental fashion:

> By accretion an institution merely encompasses a new program along with the old--a new occupational course, a research project, a new undergraduate tradition. And through attrition, other programs and functions are abandoned, either because they become outdated...or because they come to be performed by other institutions.
>
> (Hefferlin, 1969:25)

Trinkaus and Booke (1980), in an empirical study of the curriculum change process in graduate schools of business, divided participants into two groups: externals including trustees, alumni, and community leaders and internals including administrators, faculty members, and students. The results showed that all participants, i.e., both externals and internals, most frequently exhibited the following behaviours when attempting to bring about curriculum change:

1. They attempted to form coalitions through informal presentations of the proposed changes.
2. They negotiated responses to future curriculum change proposals. ("If you support our proposal we will support yours.")
3. They attempted to reduce opposition, for example, by schedulinig meetings at inconvenient times.

Milton (1970), in summarizing trends in curricular reform, observes that small universities more so than large universities are inclined toward structural reform of curriculums. In addition, there is, according to Milton (1970), a general trend toward multidisciplinary programs of study.

Summary

This chapter has dealt with the evolution of university study in Alberta and with possible future trends in university curricular reform.

The development of the structures of universities concerned directly with the delivery of study programs has been traced. The purpose in doing this was to point out the main environmental forces operating on the universities throughout the years. The trend has been one of continual growth. Except for brief periods during the world wars and during the 1930's the history of universities in Alberta until recently has been one of expansion based on financial support from governments and support in enrollments from the public at large. In recent years, however, the situation has been one of decline--at least in financial support.

The suggestion was made that universities formulate proposals for their own future development. The area of study programs was taken as one example of an area in which proposals for future development could be drawn up.

Also, some perspectives on university curricular reform were outlined. The purpose in this was to offer some thoughts about possible future directions in curricular reform. Most authors see programs offered by universities today as inadequate. Some believe the inadequacy to be basically structural and thus potentially solvable through tinkering. A few authors see it as resulting from adherence to wrong ideals and thus as a problem requiring a shift in values to solve. Interestingly, it appears that at present little has been written addressing curricular problems under conditions of declining resources.

CHAPTER 6

Outline and Analysis of Data

The purposes of this study were: (1) to forecast the environmental forces likely to have an impact on the operations of selected departments in the Faculties of Science and Education at the Universities of Alberta and Calgary in the next five years, (2) to predict the likely impact of the forces on programs of study offered, and (3) to outline options available to departments for dealing with problems expected in the area of program development.

Data were assembled one round at a time. The questionnaire for Round I was based on material taken from the literature. Each of the other questionnaires was constructed using data gathered in the round coming before. Thus, the analysis of the data also proceeded one round at a time. In presenting the outline and analysis of the data in this chapter the round-by-round format has been used.

Round I

Overview

The purpose of the first round of data gathering was to have respondents identify environmental forces both inside and outside of the universities which they believe will have an impact on the operation of their faculties and departments in the next five years.

The questionnaire (Appendix B) was made up of open-ended questions. Space was provided for 15 responses. In addition to the open-ended questions the questionnaires contained a brief outline of the features of a Delphi study and a list of examples of environmental forces. The list was compiled after surveying the literature on organizational environments. It was included for the purpose of assisting respondents in their deliberations.

Questionnaires were distributed to 16 individuals at the Universities of Alberta and Calgary currently holding positions as deans, department chairmen, administrative officers, and senior professors in the Faculties of Science and Education. Eight questionnaires were returned.

Data for Round I, after editing, consisted of 34 environmental forces. The forces were grouped into seven categories using principles of content analysis. These groups were then used as the basis of the questionnaire for Round II.

Categories of Forces

After examining the environmental forces identified by respondents the following categories were outlined:

- Economic Forces,
- Political Forces,
- Technological Forces,
- Forces Arising Due to Dynamics Within the Society as a Whole,

- Forces Relating to the Internal Dynamics of Universities,
- Forces Arising from Relations Between Universities and Professionals, and
- Forces Arising from Relations Between Universities and Other Significant Organizations in the Environment.

After the categories were developed the environmental forces were sorted into the appropriate categories.

Environmental Forces Identified by Respondents

Table 2 shows the environmental forces identified by respondents in Round I grouped according to the categories defined. Along with a list of the forces in each of the categories the table also indicates the number of respondents that identified each force and the number of reasons cited for the importance of each force.

Seven of the environmental forces identified by respondents were assigned to the category entitled Economic Forces. The specific forces placed in this category were the economic recession, identified by seven respondents, the relatively low demand in the employment market for graduates, identified by four respondents, and the relatively high demand in the employment market for (some) graduates, the decrease in funds available for research, the high unemployment rate among young people, the lack of money from university sources needed to hire teaching assistants, and the shortage of support (clerical) staff, each of which were identified by one respondent.

Table 2

Environmental Forces Identified by Respondents in Round I with Numbers of Respondents and Numbers of Reasons Cited

Environmental Forces	Number of Respondents	Number of Reasons Cited
1. Economic Forces		
Economic recession	7	5
Relatively low demand in the employment market for graduates	4	2
Relatively high demand in the employment market for graduates	1	1
Decrease in funds available for research	1	1
A high unemployment rate among young people	1	1
Lack of money from university sources needed to hire teaching assistants	1	1
Shortage of support (clerical) staff	1	1
2. Political Forces		
Government policies of fiscal restraint	4	3
Continued low priority by government for education	1	1
Growing opportunities in some fields due to emerging government support	1	1
3. Technological Forces		
Computer technology	6	6

Table 2
(continued)

Environmental Forces	Number of Respondents	Number of Reasons Cited
4. Forces Arising Due to Dynamics Within the Society as a Whole		
Demand for study programs coming from the public at large	2	2
Increased demand for post-secondary education as a means to assuring the individual a more competitive position in the employment market	1	1
Society's aging population	1	1
Decline in the size and change in the nature of the family unit	1	1
Gradual increase in direct public involvement in significant educational decisions	1	1
Demand for post-secondary education from foreign countries--especially developing countries	1	5
5. Forces Relating to the Internal Dynamics of Universities		
Curricular reform	6	4
Developments in special programs	1	1
A shift in priorities from undergraduate to graduate training	2	1
A desire on the part of faculties and departments for greater flexibility in programs	1	1
Changes in the nature and composition of the student population	1	1

Table 2
(continued)

Environmental Forces	Number of Respondents	Number of Reasons Cited
Quotas on the numbers of students admitted to programs	2	2
Greater emphasis on standards of scholarship	1	1
Limited staff mobility	1	1
Aging faculty	1	2
Faculty retirements	2	2
6. Forces Arising from Relations Between Universities and Professionals		
Demands from professionals for greater access to programs	1	1
Demands from professionals for increases in inservice training	1	1
Pressure from professional associations	1	1
Pressure from accrediting agencies or similar organizations	1	1
7. Forces Arising from Relations Between Universities and Other Significant Organizations in the Environment		
Demands for education resulting from developments in specific industries	1	1
Alternative types of post-secondary education available	1	1
Pressure on universities for greater cooperation and knowledge sharing coming from industry and other significant organizations in the environment	1	1

Three environmental forces were placed in the category labelled Political Forces. These were government policies of fiscal restraint, identified by four respondents, and the continued low priority by government for education and growing opportunities in some fields due to emerging government support, both of which were identified by one respondent.

The category entitled Technological Forces was assigned one force. This was computer technology, identified by six respondents.

The category labelled Forces Arising Due to Dynamics Within the Society as a Whole was given six forces. These were the demand for study programs coming from the public at large, identified by two respondents, and the increased demand for post-secondary education as a means to assuring the individual a more competitive position in the employment market, society's aging population, the decline in size and change in the nature of the family unit, the gradual increase in direct public involvement in significant educational decisions, and the demand for post-secondary education from foreign countries--especially developing countries, each of which were identified by one respondent.

Ten of the environmental forces identified by respondents in Round I were placed in the category called Forces Relating to the Internal Dynamics of Universities. These were curricular reform, identified by six respondents, a shift in priorities from undergraduate to graduate training, quotas on the numbers of students admitted to programs, and faculty retirements, each of which was identified by two respondents. Developments in special programs, a desire on the part of faculties and departments for greater flexibility in programs, changes in the nature and composition of the student population, greater emphasis on standards of scholarships, limited staff mobility, and the aging faculty were each identified by one respondent.

The group of forces entitled Forces Arising from Relations Between Universities and Professionals was assigned four forces. Each was identified by one respondent. The forces were demands from professionals for greater access to programs, demands from professionals for increases in inservice training, pressure from professional associations, and pressure from accrediting agencies or similar organizations.

The last group of forces entitled Forces Arising from Relations Between Universities and Other Significant Organizations in the Environment was assigned three forces. Again, each force was outlined by one respondent. The forces were demands for education resulting from developments in specific industries, alternative types of post-secondary education available, and pressure on universities for greater cooperation and knowledge sharing coming from industry and other significant organizations in the environment.

Reasons for Importance Cited

The reasons stated for the importance of the environmental forces reflected a broad range of opinion on the part of respondents. In almost all cases, however, the reasons were stated in terms of some direct impact on universities. Reasons were both general and specific with the majority being specific. They tended to outline the effects of an environmental force on some particular aspect of the operation of a faculty or department.

The intention at the outset was to ask respondents in Round II to rate, in some way, the reasons for the importance of each force as stated in Round I. During the preparation of the questionnaire for Round II, however, it was decided to omit consideration of the reasons in order to allow for a more manageable questionnaire.

Round II

Overview

The environmental forces outlined in Round I were placed into seven categories for the purpose of constructing the questionnaire for Round II. The purpose of the second round of data collecting was to have respondents rate the environmental forces identified. The questionnaire required respondents to consider individually each environmental force, first of all, in terms of its likelihood of affecting their faculties or departments over the next five years and, secondly, for its potential impact on admissions to programs, the content of programs, and instructor/student interaction in programs.

Questionnaires (Appendix C) were given to 28 individuals at the Universities of Alberta and Calgary. Most of these were people holding the rank of professor in their various departments. The departments represented were as follows: in the Faculty of Science the Departments of Chemistry, Physics, and Geology and in the Faculty of Education the Departments of Elementary Education and Educational Administration.

The purpose of the questionnaire and the instructions given to respondents relating to it seemed clear as no significant problems arose. Twenty-five of the respondents returned the questionnaire. Occasional questionnaire items were omitted by some respondents. Also, in some cases respondents offered written remarks on items.

Results

Forecasted Likelihood of Environmental Forces Affecting Departments. Table 3 shows the forecasted likelihood of each environmental force affecting the departments selected in the next five years. The forecasted likelihood for each force was taken as the mean of the responses expressed in terms of one of the following categories: 0 - 1.49 = Very Unlikely, 1.50 - 2.49 = Not likely, 2.50 - 3.49 = Likely, and 3.50 - 4.00 = Very Likely.

Among the seven economic forces estimated as liable to affect the selected departments the economic recession was the one force rated as very likely to have an influence. In addition, five of the economic forces were rated as likely to affect the departments. These were the lack of money from university sources needed to hire teaching assistants, the shortage of support (clerical) staff, the high

Table 3

Forecasted Likelihood of Environmental Forces Affecting Both the Science and Education Departments Selected in the Next Five Years

Environmental Forces	Adjusted Frequencies of Response to Questionnaire Items (%)* 1	2	3	4	Mean	Standard Deviation	Number
Economic Forces							
• Economic recession	-	-	40.0	60.0	3.60	0.50	25
• Relatively low demand in the employment market for graduates of your faculty or department	4.1	29.2	50.0	16.7	2.79	0.78	24
• Relatively high demand in the employment market for graduates of your faculty or department	30.4	17.4	47.9	4.3	2.26	0.96	23
• Decrease in funds available for research	12.0	28.0	40.0	20.0	2.68	0.95	25
• A high unemployment rate among young people	4.0	16.0	56.0	24.0	3.00	0.76	25

*Categories of responses to questionnaire items:
0-1.49 = Very Unlikely, 1.50-2.49 = Not Likely, 2.50-3.49 = Likely, 3.50-4.00 Very Likely

Table 3
(continued)

Environmental Forces	Adjusted Frequencies of Response to Questionnaire Items (%)* 1	2	3	4	Mean	Standard Deviation	Number
Economic Forces (continued)							
• Lack of money from university sources needed to hire teaching assistants	-	4.0	48.0	48.0	3.44	0.58	25
• Shortage of support (clerical) staff	-	28.0	40.0	32.0	3.04	0.79	25
Political Forces							
• Government policies of fiscal restraint	-	-	32.0	68.0	3.68	0.48	25
• Continued low priority by government for education	-	-	41.7	58.3	3.58	0.50	24
• Growing opportunities in some fields due to emerging government support	-	45.8	45.8	8.4	2.63	0.65	24

*Categories of responses to questionnaire items:
0-1.49 = Very Unlikely, 1.50-2.49 = Not Likely, 2.50-3.49 = Likely, 3.50-4.00 Very Likely

Table 3
(continued)

Environmental Forces	Adjusted Frequencies of Response to Questionnaire Items (%)* 1	2	3	4	Mean	Standard Deviation	Number
Technological Forces							
• Computer technology	-	8.0	32.0	60.0	3.52	0.65	25
Forces Arising Due to Dynamics Within the Society as a Whole							
• Social demand for education. Demand for study programs coming from the public at large	8.3	16.7	66.7	8.3	2.75	0.74	24
• Increased demand for post-secondary education as a means to assuring the individual a more competitive position in the employment market	-	25.0	41.7	33.3	3.08	0.78	24
• Society's aging population	12.0	36.0	44.0	8.0	2.48	0.82	25

*Categories of responses to questionnaire items:
0-1.49 = Very Unlikely, 1.50-2.49 = Not Likely, 2.50-3.49 = Likely, 3.50-4.00 Very Likely

Table 3
(continued)

Environmental Forces	Adjusted Frequencies of Response to Questionnaire Items (%)*				Mean	Standard Deviation	Number
	1	2	3	4			
Forces Arising Due to Dynamics Within the Society as a Whole (continued)							
• Decline in the size and change in the nature of the family unit	32.0	48.0	20.0	-	1.88	0.73	25
• Gradual increase in direct public involvement in significant educational decisions	20.0	44.0	28.0	8.0	2.24	0.88	25
• Demand for post-secondary education from foreign countries--especially developing countries	12.0	40.0	32.0	16.0	2.52	0.92	25
Forces Relating to the Internal Dynamics of Universities							
• Curricular reform	8.0	36.0	36.0	20.0	2.68	0.90	25

*Categories of responses to questionnaire items:
0-1.49 = Very Unlikely, 1.50-2.49 = Not Likely, 2.50-3.49 = Likely, 3.50-4.00 Very Likely

Table 3
(continued)

Environmental Forces	Adjusted Frequencies of Response to Questionnaire Items (%)* 1	2	3	4	Mean	Standard Deviation	Number
Forces Relating to the Internal Dynamics of Universities (continued)							
• Developments in special programs	4.0	28.0	48.0	20.0	2.84	0.80	25
• A shift in priorities from undergraduate to graduate training	12.0	32.0	48.0	8.0	2.52	0.82	25
• A desire on the part of faculties and departments for greater flexibility in programs, i.e., to prepare students to the maximum degree possible bearing in mind fluctuations in the employment market	8.0	48.0	36.0	8.0	2.44	0.77	25
• Changes in the nature and composition of the student population	4.0	48.0	36.0	12.0	2.56	0.77	25

*Categories of responses to questionnaire items:
0-1.49 = Very Unlikely, 1.50-2.49 = Not Likely, 2.50-3.49 = Likely, 3.50-4.00 Very Likely

Table 3
(continued)

Environmental Forces	Adjusted Frequencies of Response to Questionnaire Items (%)* 1	2	3	4	Mean	Standard Deviation	Number
Forces Relating to the Internal Dynamics of Universities (continued)							
• Quotas regarding the numbers of students admitted to programs	8.0	4.0	40.0	48.0	3.28	0.89	25
• Greater emphasis on standards of scholarship	8.0	8.0	60.0	24.0	3.00	0.82	25
• Limited staff mobility	4.2	12.5	37.5	45.8	3.25	0.85	24
• Aging faculty	8.0	12.0	32.0	48.0	3.20	0.96	25
• Faculty retirements	8.0	12.0	48.0	32.0	3.04	0.89	25

*Categories of responses to questionnaire items:
0-1.49 = Very Unlikely, 1.50-2.49 = Not Likely, 2.50-3.49 = Likely, 3.50-4.00 Very Likely

Table 3
(continued)

Environmental Forces	Adjusted Frequencies of Response to Questionnaire Items (%)* 1	2	3	4	Mean	Standard Deviation	Number
Forces Arising from Relations Between Universities and Professionals							
• Demands from professionals for greater access to programs	4.0	40.0	48.0	8.0	3.60	0.71	25
• Demands from professionals for increases in inservice training	4.0	40.0	44.0	12.0	2.64	0.75	25
• Pressure from professional associations	20.0	28.0	48.0	4.0	2.36	0.86	25
• Pressure from accrediting agencies of similar organizations	29.2	33.3	29.2	8.3	2.17	0.96	24

*Categories of responses to questionnaire items:
0-1.49 = Very Unlikely, 1.50-2.49 = Not Likely, 2.50-3.49 = Likely, 3.50-4.00 Very Likely

Table 3
(continued)

Environmental Forces	Adjusted Frequencies of Response to Questionnaire Items (%)* 1	2	3	4	Mean	Standard Deviation	Number
Forces Arising from Relations Between Universities and Other Significant Organizations in the Environment							
● Demands for education resulting from developments in specific industries	32.0	36.0	28.0	4.0	2.04	0.89	25
● Alternative types of post-secondary education available	12.0	60.0	24.0	4.0	2.20	0.71	25
● Pressure on universities for greater formal and informal co-operation and knowledge sharing coming from industry or other significant organizations in the environment	8.0	40.0	44.0	8.0	2.52	0.77	25

*Categories of responses to questionnaire items:
0-1.49 = Very Unlikely, 1.50-2.49 = Not Likely, 2.50-3.49 = Likely, 3.50-4.00 Very Likely

unemployment rate among young people, the relatively low demand in the employment market for graduates, and the decrease in funds available for research. The last of the economic forces outlined by respondents--a relatively high demand in the employment market for graduates--was rated as not likely to affect the departments.

Three political forces were identified by the respondents. Of these, government policies of fiscal restraint and the continued low priority by government for education were rated as very likely to affect the selected departments. The third political force--growing opportunities in some fields due to emerging government support--was rated as likely to affect the departments.

The category of technological forces contained only one environmental force. The force was computer technology. It was rated as very likely to affect the selected departments in the next five years.

Six of the environmental forces forecasted in Round I were interpreted as resulting from social dynamics. Among these, three were rated as likely to affect the departments. These were the demand for post-secondary education as a means to assuring the individual a more competitive position in the employment market, the demand for study programs coming from the public at large, and the demand for post-secondary education from foreign countries--especially developing countries. The remaining three forces identified by the respondents: society's aging population, a gradual increase in direct public involvement in significant educational decisions, and the decline in the size and change in the nature of the family unit were rated as not likely to affect the departments selected.

Some attention must be given, at this point, to the environmental force identified in Round I as, "[a] gradual increase in direct public involvement in significant educational decisions." An error was made in classifying the response which, in effect, invalidates it. The force can be interpreted to mean two quite different things depending upon what one understands by the term "public." Specifically, "public" may be understood to mean either the public at large or the government. When preparing the questionnaire for Round II the force was understood to refer to the public at large and it was grouped among those forces arising due to social dynamics. However, in reconsidering the reason for the response cited in Round I it seems that what the respondent meant by "public" was the government (and its agents). Thus, the force should have been grouped with the political forces. One can reasonably conclude that if this had been done the response in Round II, in terms of the likelihood of the force affecting the departments in question, may have been different from that obtained. Therefore, at present, there is no alternative but to consider all responses to this one particular force invalid.

Ten of the forces identified by the respondents in Round I were considered as relating to the internal operations of the universities themselves. Among these, nine were considered likely to affect the departments selected in the next five years and one was considered not likely to affect the departments. The nine regarded as likely to have an impact were quotas on the numbers of students admitted to programs, limited staff mobility, the aging faculty, faculty retirements, and a generally greater emphasis on standards of scholarships on the part of universities. Developments in special programs, curricular reform, changes in the nature and composition of the student population and a shift in priorities from undergraduate to graduate training were rated as slightly less potentially influential. The environmental force reported as not likely to affect the departments was a desire on the part of faculties and departments for greater flexibility in programs of study with the aim of preparing students to the maximum degree possible bearing in mind fluctuations in the employment market.

Among the four environmental forces considered as products of interactions between universities and professionals, demands from professionals for greater access to study programs was rated as very likely to affect the selected departments. Rated as likely to affect the departments was demands from professionals for increases in inservice training. Pressure from professional associations and pressure from accrediting agencies or similar organizations were considered not likely to affect the selected departments.

Three of the forces outlined in Round I were grouped in the category of relations between universities and other organizations. Among these, one was considered by respondents as likely to affect the departments selected in the next five years and two were rated as not likely to affect the departments. Considered as likely was pressure on universities for greater formal and informal cooperation and knowledge sharing coming from industry or other significant organizations in the environment. Alternative types of post-secondary education available and demands for education resulting from developments in specific industries were rated as not likely to affect the departments.

Estimated Impact of Environmental Forces on Admissions to Programs of Study. Table 4 shows the expected impact of the environmental forces on admissions to programs of study as forecasted by the respondents. The forecasted impact on admissions was interpreted as the mean of the responses expressed in terms of one of the following categories: 0 - 1.49 = Negligible Impact, 1.50 - 2.49 = Low Impact, 2.50 - 3.49 = Moderate Impact, and 3.50 - 4.00 = High Impact.

Among the seven economic forces identified by respondents four were rated as likely to have a moderate impact on admissions to programs in the selected departments in the next five years and three were rated as likely to have a low impact. The four forces estimated as likely to have a moderate impact were the economic recession, the lack of money from university sources needed to hire teaching assistants, the high unemployment rate among young people, and the relatively low demand in the employment market for graduates. The three forces forecasted as likely to have a low impact were the relatively high demand in the employment market for graduates, the shortage of support (clerical) staff, and the decrease in funds available for research.

Three political forces were outlined by respondents. Of these, government policies of fiscal restraint and the continued low priority

Table 4

Forecasted Levels of Impact of Environmental Forces on Admissions to Programs of Study in the Next Five Years

Environmental Forces	Adjusted Frequencies of Response to Questionnaire Items (%)* 1	2	3	4	Mean	Standard Deviation	Number
Economic Forces							
• Economic recession	8.0	20.0	48.0	24.0	2.88	0.88	25
• Relatively low demand in the employment market for graduates of your faculty or department	12.0	32.0	36.0	20.0	2.64	0.95	25
• Relatively high demand in the employment market for graduates of your faculty or department	23.8	23.8	47.6	4.8	2.33	0.91	21
• Decrease in funds available for research	56.0	36.0	8.0	-	1.52	0.65	25
• A high unemployment rate among young people	8.0	24.0	44.0	24.0	2.84	0.90	25

*Categories of responses to questionnaire items:
0-1.49 = Negligible Impact, 1.50-2.49 = Low Impact, 2.50-3.49 = Moderate Impact, 3.50-4.00 = High Impact

Table 4
(continued)

Environmental Forces	Adjusted Frequencies of Response to Questionnaire Items (%)*				Mean	Standard Deviation	Number
	1	2	3	4			
Economic Forces (continued)							
• Lack of money from university sources needed to hire teaching assistants	8.3	29.2	29.2	33.3	2.88	0.99	24
• Shortage of support (clerical) staff	52.0	32.0	16.0	-	1.64	0.76	25
Political Forces							
• Government policies of fiscal restraint	4.0	12.0	44.0	40.0	3.20	0.82	25
• Continued low priority by government for education	20.8	25.0	25.0	29.2	2.63	1.14	24
• Growing opportunities in some fields due to emerging government support	20.8	37.5	41.7	-	2.21	0.78	24

*Categories of responses to questionnaire items:
0-1.49 = Negligible Impact, 1.50-2.49 = Low Impact, 2.50-3.49 = Moderate Impact, 3.50-4.00 = High Impact

Table 4
(continued)

Environmental Forces	Adjusted Frequencies of Response to Questionnaire Items (%)* 1	2	3	4	Mean	Standard Deviation	Number
Technological Forces							
• Computer technology	36.0	40.0	8.0	16.0	2.04	1.06	25
Forces Arising Due to Dynamics Within the Society as a Whole							
• Social demand for education. Demand for study programs coming from the public at large	16.6	29.2	50.0	4.2	2.42	0.83	24
• Increased demand for post-secondary education as a means to assuring the individual a more competitive position in the employment market	8.3	20.8	54.2	16.7	2.79	0.83	24
• Society's aging population	44.0	16.0	36.0	4.0	2.00	1.00	25

*Categories of responses to questionnaire items:
0-1.49 = Negligible Impact, 1.50-2.49 = Low Impact, 2.50-3.49 = Moderate Impact, 3.50-4.00 = High Impact

Table 4
(continued)

Environmental Forces	Adjusted Frequencies of Response to Questionnaire Items (%)* 1	2	3	4	Mean	Standard Deviation	Number
Forces Arising Due to Dynamics Within the Society as a Whole (continued)							
• Decline in the size and change in the nature of the family unit	60.0	32.0	8.0	-	1.48	0.65	25
• Gradual increase in direct public involvement in significant educational decisions	50.0	29.2	16.1	4.2	1.75	0.90	24
• Demand for post-secondary education from foreing countries -- especially developing countries	28.0	28.0	28.0	16.0	2.32	1.07	25
Forces Relating to the Internal Dynamics of Universities							
• Curricular reform	40.0	40.0	12.0	8.0	1.88	0.93	25

*Categories of responses to questionnaire items:
0-1.49 = Negligible Impact, 1.50-2.49 = Low Impact, 2.50-3.49 = Moderate Impact, 3.50-4.00 = High Impact

Table 4
(continued)

Environmental Forces	Adjusted Frequencies of Response to Questionnaire Items (%)*				Mean	Standard Deviation	Number
	1	2	3	4			
Forces Relating to the Internal Dynamics of Universities (continued)							
• Developments in special programs	24.0	40.0	16.0	20.0	2.32	1.07	25
• A shift in priorities from undergraduate to graduate training	24.0	32.0	28.0	16.0	2.36	1.04	25
• A desire on the part of faculties and departments for greater flexibility in programs, i.e., to prepare students to the maximum degree possible bearing in mind fluctuations in the employment market	24.0	52.0	20.0	4.0	2.04	0.79	25
• Changes in the nature and composition of the student population	8.0	44.0	32.0	16.0	2.56	0.87	25

*Categories of responses to questionnaire items:
0-1.49 = Negligible Impact, 1.50-2.49 = Low Impact, 2.50-3.49 = Moderate Impact, 3.50-4.00 = High Impact

Table 4
(continued)

Environmental Forces	Adjusted Frequencies of Response to Questionnaire Items (%)* 1	2	3	4	Mean	Standard Deviation	Number
Forces Relating to the Internal Dynamics of Universities (continued)							
• Quotas regarding the numbers of students admitted to programs	8.0	8.0	20.0	64.0	3.40	0.96	25
• Greater emphasis on standards of scholarship	8.0	16.0	52.0	24.0	2.92	0.86	25
• Limited staff mobility	79.2	16.6	-	4.2	1.29	0.69	24
• Aging faculty	72.0	24.0	4.0	-	1.32	0.56	25
• Faculty retirement	68.0	20.0	8.0	4.0	1.48	0.82	25

*Categories of responses to questionnaire items:
0-1.49 = Negligible Impact, 1.50-2.49 = Low Impact, 2.50-3.49 = Moderate Impact, 3.50-4.00 = High Impact

Table 4
(continued)

Environmental Forces	Adjusted Frequencies of Response to Questionnaire Items (%)* 1	2	3	4	Mean	Standard Deviation	Number
Forces Arising from Relations Between Universities and Professionals							
• Demands from professionals for greater access to programs	32.0	28.0	36.0	4.0	2.12	0.93	25
• Demands from professionals for increases in inservice training	24.0	44.0	28.0	4.0	2.12	0.83	25
• Pressure from professional associations	32.0	36.0	32.0	-	2.00	0.82	25
• Pressure from accrediting agencies or similar organizations	58.3	25.0	12.5	4.2	1.63	0.88	24

*Categories of responses to questionnaire items:
0-1.49 = Negligible Impact, 1.50-2.49 = Low Impact, 2.50-3.49 = Moderate Impact, 3.50-4.00 = High Impact

Table 4
(continued)

Environmental Forces	Adjusted Frequencies of Response to Questionnaire Items (%)*				Mean	Standard Deviation	Number
	1	2	3	4			
Forces Arising from Relations Between Universities and Other Significant Organizations in the Environment							
• Demands for education resulting from developments in specific industries	56.0	32.0	8.0	4.0	1.60	0.82	25
• Alternative types of post-secondary education available	28.0	40.0	20.0	12.0	2.16	0.99	25
• Pressure on universities for greater formal and informal co-operation and knowledge sharing coming from industry or other significant organizations in the environment	60.0	28.0	12.0	-	1.52	0.71	25

*Categories of responses to questionnaire items:
0-1.49 = Negligible Impact, 1.50-2.49 = Low Impact, 2.50-3.49 = Moderate Impact, 3.50-4.00 = High Impact

by government for education were forecasted as likely to have a moderate impact on admissions to programs. Growing opportunities in some fields due to emerging government support was rated as likely to have a low impact on admissions by the departments selected.

The one environmental force considered technological in nature--computer technology--was rated as likely to have a low impact on admissions to programs.

Among the six environmental forces occurring as a result of societal change one was considered as likely to have a moderate impact on admissions to study programs, four were considered as likely to have a low impact, and one was rated as likely to have a negligible impact. Increased demand for post-secondary education as a means to assuring the individual a more competitive position in the employment market was rated as moderate in its potential impact. Rated as likely to have a low impact on admissions were the demand for study programs coming from the public at large, the demand for post-secondary education from foreign countries--especially developing countries, society's aging population, and the gradual increase in direct public involvement in significant educational decisions. Reported as likely to have a negligible impact on admissions to programs was the decline in the size and change in the nature of the family unit.

Ten of the environmental forces outlined by the respondents were considered as resulting from changes occurring within the universities themselves. Among these ten forces three were rated in Round II as likely to have a moderate impact on admissions by the selected departments. These included quotas on the numbers of students admitted to programs, greater emphasis on standards of scholarships, and changes in the nature and composition of the student population. In addition, four forces were estimated as likely to have a low impact on admissions. These were a shift in priorities from undergraduate to graduate training, developments in special programs, a desire on the part of faculties and departments for greater flexibility in programs in order to prepare students to the maximum degree possible bearing in mind fluctuations in the employment market, and curricular reform. Faculty retirements, the aging faculty, and limited staff mobility were rated as likely to have a negligible impact on admissions to study programs.

Four of the forces on the questionnaire were considered as resulting from interactions between universities and professionals. All of these were rated by respondents as likely to have a low impact on admissions to study programs in the next five years. They were demands from professionals for increases in inservice training, demands from professionals for greater access to study programs, pressure from professional associations, and pressure from accrediting agencies or similar organizations.

The questionnaire for Round II contained three forces considered as resulting from relations between universities and other major organizations. As was the case with the forces arising from relations between universities and professionals, all of the forces were rated as likely to have a low impact on admissions to study programs. The forces were alternative types of post-secondary education available, demands for education resulting from developments in specific industries, and pressure on universities for greater formal and informal cooperation and knowledge sharing coming from industry or other significant organizations in the environment.

Estimated Impact of Environmental Forces on Content of Programs of Study. Table 5 shows the forecasted impact of the environmental forces on the content of study programs. As with the forecasted impact on admissions, the expected impact on content is stated as the mean of the responses expressed as one of the following categories: 0 - 1.49 = Negligible Impact, 1.50 - 2.49 = Low Impact, 2.50 - 3.49 = Moderate Impact, and 3.50 - 4.00 = High Impact.

Seven environmental forces on the questionnaire were classified as economic forces. Among them, six were rated by respondents as likely to have a low impact on the content of study programs and one was rated as likely to have a negligible impact. Those expected to have a low impact were a lack of money from university sources needed to hire teaching assistants, the relatively low demand in the employment market for graduates, the economic recession, the decrease in funds available for research, the high unemployment rate among young people, and the relatively high demand in the employment market for graduates. The economic force rated by respondents as likely to have a negligible impact on the content of study programs was the shortage of support (clerical) staff.

Table 5

Forecasted Levels of Impact of Environmental Forces on Content of Programs of Study in the Next Five Years

Environmental Forces	Adjusted Frequencies of Response to Questionnaire Items (%)* 1	2	3	4	Mean	Standard Deviation	Number
Economic Forces							
• Economic recession	45.8	25.0	25.0	4.2	1.88	0.95	24
• Relatively low demand in the employment market for graduates of your faculty or department	33.3	45.8	16.7	4.2	1.92	0.83	24
• Relatively high demand in the employment market for graduates of your faculty or department	50.0	30.0	20.0	-	1.70	0.80	20
• Decrease in funds available for research	48.0	36.0	12.0	4.0	1.72	0.84	25
• A high unemployment rate among young people	48.0	40.0	4.0	8.0	1.72	0.89	25

*Categories of responses to questionnaire items:
0-1.49 = Negligible Impact, 1.50-2.49 = Low Impact, 2.50-3.49 = Moderate Impact, 3.50-4.00 = High Impact

Table 5
(continued)

Environmental Forces	Adjusted Frequencies of Response to Questionnaire Items (%)*				Mean	Standard Deviation	Number
	1	2	3	4			
Economic Forces (continued)							
• Lack of money from university sources needed to hire teaching assistants	37.5	29.2	20.8	12.5	2.08	1.06	24
• Shortage of support (clerical) staff	60.0	32.0	8.0	-	1.48	0.65	25
Political Forces							
• Government policies of fiscal restraint	40.0	24.0	28.0	8.0	2.04	1.02	25
• Continued low priority by government for education	45.8	33.3	16.7	4.2	1.79	0.88	24
• Growing opportunities in some fields due to emerging government support	16.6	50.0	29.2	4.2	2.21	0.78	24

*Categories of responses to questionnaire items:
0-1.49 = Negligible Impact, 1.50-2.49 = Low Impact, 2.50-3.49 = Moderate Impact, 3.50-4.00 = High Impact

Table 5
(continued)

Environmental Forces	Adjusted Frequencies of Response to Questionnaire Items (%)* 1	2	3	4	Mean	Standard Deviation	Number
Technological Forces							
• Computer technology	-	28.0	44.0	28.0	3.00	0.76	25
Forces Arising Due to Dynamics Within the Society as a Whole							
• Social demand for education. Demand for study programs coming from the public at large.	29.2	25.0	41.6	4.2	2.21	0.93	24
• Increased demand for post-secondary education as a means to assuring the individual a more competitive position in the employment market	25.0	37.5	29.2	8.3	2.21	0.93	24
• Society's aging population	62.5	29.2	8.3	-	1.46	0.66	24

*Categories of responses to questionnaire items:
0-1.49 = Negligible Impact, 1.50-2.49 = Low Impact, 2.50-3.49 = Moderate Impact, 3.50-4.00 = High Impact

Table 5
(continued)

Environmental Forces	Adjusted Frequencies of Response to Questionnaire Items (%)* 1	2	3	4	Mean	Standard Deviation	Number
Forces Arising Due to Dynamics Within the Society as a Whole (continued)							
• Decline in the size and change in the nature of the family units	66.7	20.8	12.5	-	1.46	0.72	24
• Gradual increase in direct public involvement in significant educational decisions	43.5	30.4	17.4	8.7	1.91	1.00	23
• Demand for post-secondary education from foreign countries -- especially developing countries	52.0	40.0	4.0	4.0	1.60	0.76	25
Forces Relating to the Internal Dynamics of Universities							
o Curricular reform	8.0	32.0	28.0	32.0	2.84	0.99	25

*Categories of responses to questionnaire items:
0-1.49 = Negligible Impact, 1.50-2.49 = Low Impact, 2.50-3.49 = Moderate Impact, 3.50-4.00 = High Impact

Table 5
(continued)

Environmental Forces	Adjusted Frequencies of Response to Questionnaire Items (%)*				Mean	Standard Deviation	Number
	1	2	3	4			
Forces Relating to the Internal Dynamics of Universities							
• Developments in special programs	20.0	24.0	32.0	24.0	2.60	1.08	25
• A shift in priorities from undergraduate to graduate training	28.0	28.0	32.0	12.0	2.28	1.02	25
• A desire on the part of faculties and departments for greater flexibility in programs, i.e., to prepare students to the maximum degree possible bearing in mind fluctuations in the employment market	20.0	44.0	24.0	12.0	2.28	0.94	25
• Changes in the nature and composition of the student population	40.0	36.0	20.0	4.0	1.88	0.88	25

*Categories of responses to questionnaire items:
0-1.49 = Negligible Impact, 1.50-2.49 = Low Impact, 2.50-3.49 = Moderate Impact, 3.50-4.00 = High Impact

Table 5
(continued)

Environmental Forces	Adjusted Frequencies of Response to Questionnaire Items (%)*				Mean	Standard Deviation	Number
	1	2	3	4			
Forces Relating to the Internal Dynamics of Universities (continued)							
• Quotas regarding the numbers of students admitted to programs	29.2	50.0	16.6	4.2	1.96	0.81	24
• Greater emphasis on standards of scholarship	20.0	32.0	36.0	12.0	2.40	0.96	25
• Limited staff mobility	45.8	25.0	20.8	8.4	1.92	1.01	24
• Aging faculty	28.0	44.0	28.0	-	2.00	0.76	25
• Faculty retirements	32.0	36.0	24.0	8.0	2.08	0.95	25

*Categories of responses to questionnaire items:
0-1.49 = Negligible Impact, 1.50-2.49 = Low Impact, 2.50-3.49 = Moderate Impact, 3.50-4.00 = High Impact

Table 5
(continued)

Environmental Forces	Adjusted Frequencies of Response to Questionnaire Items (%)* 1	2	3	4	Mean	Standard Deviation	Number
Forces Arising from Relations Between Universities and Professionals							
• Demands from professionals for greater access to programs	36.0	20.0	40.0	4.0	2.12	0.97	25
• Demands from professionals for increases in inservice training	24.0	36.0	40.0	-	2.16	0.80	25
• Pressure from professional associations	24.0	40.0	36.0	-	2.12	0.78	25
• Pressure from accrediting agencies or similar organizations	45.8	16.7	33.3	4.2	1.96	1.00	24

*Categories of responses to questionnaire items:
0-1.49 = Negligible Impact, 1.50-2.49 = Low Impact, 2.50-3.49 = Moderate Impact, 3.50-4.00 = High Impact

Table 5
(continued)

Environmental Forces	Adjusted Frequencies of Response to Questionnaire Items (%)* 1	2	3	4	Mean	Standard Deviation	Number
Forces Arising from Relations Between Universities and Other Significant Organizations in the Environment							
• Demands for education resulting from developments in specific industries	52.0	16.0	28.0	4.0	1.84	0.99	25
• Alternative types of post-secondary education available	60.0	24.0	4.0	12.0	1.68	1.03	25
• Pressure on universities for greater formal and informal co-operation and knowledge sharing coming from industry or other significant organizations in the environment	32.0	32.0	36.0	-	2.04	0.84	25

*Categories of responses to questionnaire items:
0-1.49 = Negligible Impact, 1.50-2.49 = Low Impact, 2.50-3.49 = Moderate Impact, 3.50-4.00 = High Impact

Three environmental forces were classified as political forces. In terms of their effects on the content of study programs all three were considered by respondents as likely to have a low impact. The forces were as follows: growing opportunities in some fields due to emerging government support, government policies of fiscal restraint, and continued low priority by government for education.

The one environmental force classified as a technological force--computer technology--was rated by respondents as likely to have a moderate impact on the content of study programs.

Among the six environmental forces regarded as resulting from social change, four were rated as likely to have a low impact on the content of study programs over the next five years and two were reported as likely to have a negligible impact. Rated as likely to have a low impact were the demand for study programs coming from the public at large and an increased demand for post-secondary education as a means to assuring the individual a more competitive position in the employment market, the gradual increase in direct public involvement in significant educational decisions, and the demand for post-secondary education from foreign countries--especially developing countries. Forecasted as likely to have a negligible impact on the content of study programs were society's aging population and the decline in size and change in the nature of the family unit.

Ten of the forces listed on the questionnaire for Round II were considered as resulting from the internal operations of the universities. Among these, curricular reform and developments in special programs were rated as likely to have a moderate influence on the content of programs of study. The remaining eight forces were estimated as likely to have a low impact on the content of study programs. These were greater emphasis on standards of scholarship, a shift in priorities from undergraduate to graduate training, a desire on the part of faculties and departments for greater flexibility in programs in order to prepare students to the maximum degree possible bearing in mind fluctuations in the employment market, faculty retirements, the aging faculty, quotas regarding the numbers of students admitted to programs, limited staff mobility, and changes in the nature and composition of the student population.

Four environmental forces were considered as resulting from relations between universities and professionals. In terms of their effects on the content of programs of study in the next five years all four were rated as likely to have a low impact. The forces were demands from professionals for increases in inservice training, demands from professionals for greater access to programs, pressure from professional associations, and pressure from accrediting agencies or similar organizations.

As was the case with the forces arising due to relations between universities and professionals, the three forces grouped in this final section were also considered by respondents as likely to have a low impact on the content of study programs over the next five years. The forces were pressure on universities for greater formal and informal cooperation and knowledge sharing coming from industry or other significant organizations in the environment, demands for education resulting from developments in specific industries, and alternative types of post-secondary education available.

Estimated Impact of Environmental Forces on Instructor/Student Interaction. Table 6 shows the predicted impact of the environmental forces on instructor/student interaction. Again, as with the forecasted impact on admissions and content, the estimated impact of the environmental forces on interaction is stated as the mean of the responses expressed as one of the following categories: 0 - 1.49 = Negligible Impact, 1.50 - 2.49 = Low Impact, 2.50 - 3.49 = Moderate Impact, and 3.50 - 4.00 = High Impact.

Among the seven economic forces included in the questionnaire, two were regarded by respondents as likely to have a moderate impact on instructor/student interaction. These were the lack of money from university sources needed to hire teaching assistants and the economic recession. In addition, four of the forces were estimated as likely to have a low impact. These included the high unemployment rate among young people, the decrease in funds available for research, the shortage of support (clerical) staff, and the relatively low demand in the employment market for graduates. Finally, one force listed in this category was reported as likely to have a negligible impact on interaction. That was the relatively high demand in the employment market for graduates.

Table 6

Forecasted Levels of Impact of Environmental Forces on Instructor/Student Interaction in the Next Five Years

Environmental Forces	Adjusted Frequencies of Response to Questionnaire Items (%)* 1	2	3	4	Mean	Standard Deviation	Number
Economic Forces							
• Economic recession	16.7	25.0	50.0	8.3	2.50	0.89	24
• Relatively low demand in the employment market for graduates in your faculty or department	58.3	29.2	8.3	4.2	1.58	0.83	24
• Relatively high demand in the employment market for graduates in your faculty or department	65.0	25.0	10.0	-	1.45	0.69	20
• Decrease in funds available for research	40.0	44.0	8.0	8.0	1.84	0.90	25
• A high unemployment rate among young people	36.0	40.0	20.0	4.0	1.92	0.86	25

*Categories of responses to questionnaire items:
0-1.49 = Negligible Impact, 1.50-2.49 = Low Impact, 2.50-3.49 = Moderate Impact, 3.50-4.00 = High Impact

Table 6
(continued)

Environmental Forces	Adjusted Frequencies of Response to Questionnaire Items (%)* 1	2	3	4	Mean	Standard Deviation	Number
Economic Forces (continued)							
• Lack of money from university sources needed to hire teaching assistants	16.7	12.5	45.8	25.0	2.79	1.02	24
• Shortage of support (clerical) staff	48.0	28.0	20.0	4.0	1.80	0.91	25
Political Forces							
• Government policies of fiscal restraint	32.0	12.0	44.0	12.0	2.36	1.08	25
• Continued low priority by government for education	25.0	37.5	25.0	12.5	2.25	0.99	24
• Growing opportunities in some fields due to emerging government support	41.7	37.5	20.8	-	1.79	0.78	24

*Categories of responses to questionnaire items:
0-1.49 = Negligible Impact, 1.50-2.49 = Low Impact, 2.50-3.49 = Moderate Impact, 3.50-4.00 = High Impact

Table 6
(continued)

Environmental Forces	Adjusted Frequencies of Response to Questionnaire Items (%)*				Mean	Standard Deviation	Number
	1	2	3	4			
Technological Forces							
• Computer technology	4.0	20.0	36.0	40.0	3.12	0.88	25
Forces Arising Due to Dynamics Within the Society as a Whole							
• Social demand for education. Demand for study programs coming from the public at large	41.6	25.0	29.2	4.2	1.96	0.96	24
• Increased demand for post-secondary education as a means to assuring the individual a more competitive position in the employment market	29.2	33.3	29.2	8.3	2.17	0.96	24
• Society's aging population	50.0	33.3	12.5	4.2	1.70	0.86	24

*Categories of responses to questionnaire items:
0-1.49 = Negligible Impact, 1.50-2.49 = Low Impact, 2.50-3.49 = Moderate Impact, 3.50-4.00 = High Impact

Table 6
(continued)

Environmental Forces	Adjusted Frequencies of Response to Questionnaire Items (%)* 1	2	3	4	Mean	Standard Deviation	Number
Forces Arising Due to Dynamics Within the Society as a Whole (continued)							
• Decline in the size and change in the nature of the family unit	66.6	29.2	4.2	-	1.38	0.58	24
• Gradual increase in direct public involvement in significant educational decisions	47.8	39.2	8.7	4.3	1.70	0.82	23
• Demand for post-secondary education from foreign countries -- especially developing countries	44.0	36.0	16.0	4.0	1.80	0.87	25
Forces Relating to the Internal Dynamics of Universities							
• Curricular reform	20.0	28.0	36.0	16.0	2.48	1.01	25

*Categories of responses to questionnaire items:
0-1.49 = Negligible Impact, 1.50-2.49 = Low Impact, 2.50-3.49 = Moderate Impact, 3.50-4.00 = High Impact

Table 6
(continued)

Environmental Forces	Adjusted Frequencies of Response to Questionnaire Items (%)* 1	2	3	4	Mean	Standard Deviation	Number
Forces Relating to the Internal Dynamics of Universities (continued)							
• Developments in special programs	24.0	32.0	32.0	12.0	2.32	0.99	25
• A shift in priorities from undergraduate to graduate training	40.0	12.0	48.0	-	2.08	0.95	25
• A desire on the part of faculties and departments for greater flexibility in programs, i.e., to prepare students to the maximum degree possible bearing in mind fluctuations in the employment market	24.0	36.0	40.0	-	2.16	0.80	25
• Changes in the nature and composition of the student population	32.0	40.0	12.0	16.0	2.12	1.05	25

*Categories of responses to questionnaire items:
0-1.49 = Negligible Impact, 1.50-2.49 = Low Impact, 2.50-3.49 = Moderate Impact, 3.50-4.00 = High Impact

Table 6
(continued)

Environmental Forces	Adjusted Frequencies of Response to Questionnaire Items (%)* 1	2	3	4	Mean	Standard Deviation	Number
Forces Relating to the Internal Dynamics of Universities (continued)							
● Quotas regarding the numbers of students admitted to programs	25.0	41.7	20.8	12.5	2.21	0.98	24
● Greater emphasis on standards of scholarship	24.0	28.0	32.0	16.0	2.40	1.04	25
● Limited staff mobility	41.7	29.2	20.8	8.3	1.96	1.00	24
● Aging faculty	32.0	32.0	28.0	8.0	2.12	0.97	25
● Faculty retirements	40.0	24.0	28.0	8.0	2.04	1.02	25

*Categories of responses to questionnaire items:
0-1.49 = Negligible Impact, 1.50-2.49 = Low Impact, 2.50-3.49 = Moderate Impact, 3.50-4.00 = High Impact

Table 6
(continued)

Environmental Forces	Adjusted Frequencies of Response to Questionnaire Items (%)* 1	2	3	4	Mean	Standard Deviation	Number
Forces Arising from Relations Between Universities and Professionals							
• Demands from professionals for greater access to programs	40.0	24.0	36.0	-	1.96	0.89	25
• Demands from professionals for increases in inservice training	32.0	32.0	28.0	8.0	2.12	0.97	25
• Pressure from professional associations	40.0	40.0	20.0	-	1.80	0.76	25
• Pressure from accrediting agencies or similar organizations	62.5	20.8	16.7	-	1.54	0.78	24

*Categories of responses to questionnaire items:
0-1.49 = Negligible Impact, 1.50-2.49 = Low Impact, 2.50-3.49 = Moderate Impact, 3.50-4.00 = High Impact

Table 6
(continued)

Environmental Forces	Adjusted Frequencies of Response to Questionnaire Items (%)* 1	2	3	4	Mean	Standard Deviation	Number
Forces Arising from Relations Between Universities and Other Significant Organizations in the Environment							
• Demands for education resulting from developments in specific industries	72.0	12.0	16.0	-	1.44	0.77	25
• Alternative types of post-secondary education available	56.0	24.0	12.0	8.0	1.72	0.98	25
• Pressure on universities for greater formal and informal co-operation and knowledge sharing from industry or other significant organizations in the environment	52.0	16.0	32.0	-	1.80	0.91	25

*Categories of responses to questionnaire items:
0-1.49 = Negligible Impact, 1.50-2.49 = Low Impact, 2.50-3.49 = Moderate Impact, 3.50-4.00 = High Impact

Three of the forces included in the questionnaire were grouped together as political. In terms of their effect on instructor/student interaction all were considered as likely to have a low impact. The forces were government policies of fiscal restraint, the continued low priority by government for education, and growing opportunities in some fields due to emerging government support.

Computer technology, the one environmental force representing the category of technological forces, was estimated as likely to have a moderate impact on instructor/student interaction in the next five years.

Among the six environmental forces considered as products of change in society, five were estimated as likely to have a low impact on instructor/student interaction and one was rated as likely to have a negligible impact. Rated as low were the increased demand for post-secondary education as a means to assuring the individual a more competitive position in the employment market, the demand for study programs coming from the public at large, the demand for post-secondary education from foreign countries--especially developing countries, society's aging population, and the gradual increase in direct public involvement in significant educational decisions. Estimated as likely to have a negligible impact on instructor/student interaction was the decline in size and change in nature of the family unit.

Ten of the environmental forces making up the questionnaire for Round II were considered as products of the internal operations of the universities. All ten forces were regarded by the respondents as likely to have a low impact on the nature of interactions between instructors and students.

Four forces on the questionnaire for Round II were regarded as products of interactions between universities and professionals. In terms of their potential impact on interactions between instructors and students all were rated as low.

Among the three environmental forces considered as resulting from interactions between universities and other organizations two were regarded as likely to have a low impact on interactions between instructors and students and one was rated as likely to have a negligible impact. Estimated as likely to have a low impact were pressure on universities for greater formal and informal cooperation and knowledge sharing coming from industry or other significant organizations in the environment and alternative types of post-secondary education available. Forecasted as likely to have a negligible impact were demands for education resulting from developments in specific industries.

Analysis

Data analysis for Round II consisted of three steps. The first involved placing the environmental forces in rank order. Forces were ranked according to the mean of the forecasted likelihood of affecting the selected departments in the next five years. The purpose of ranking the forces was to observe the relative likelihood of each force (or group of forces) acting as a factor in the development of the departments over the years. The second step in the data analysis involved noting those forces forecasted as potentially the most significant in terms of their impact on admissions, content, and interaction. The third step involved comparing the responses given by the two faculties represented. The purpose of the comparison was to bring to light significant differences in the environmental forces expected to act on the faculties in the next five years and in the effects of the forces on study programs.

Environmental Forces Rank-Ordered. Table 7 shows the environmental forces rank-ordered. For the purpose of discussing the rank-ordered forces the table is considered in four parts.

Ranks 1 through 7 contain eight forces. Two of these represent the category of political forces. These are government policies of fiscal restraint and the continued low priority by government for education. Two represent the category of economic forces. There are the economic recession and the lack of money from university sources needed to hire teaching assistants. Two represent the category of forces arising from the internal dynamics of the universities. These are quotas on the numbers of students admitted to programs and limited staff mobility. One force represents the category of forces arising from relations between universities and professionals. This is demands from professionals for greater access to study programs. In addition to these, computer technology is included.

Ranks 1 through 7 must be considered very carefully. At first it appears that, according to respondents' perceptions, no single category

Table 7

Rank-Ordered List of Environmental Forces by Mean of Forecasted Likelihood of Affecting Both Science and Education Departments Selected

Rank	Environmental Force	Category	Mean of Forecasted Likelihood of Affecting Departments
1	Government policies of fiscal restraint	Political	3.68
2	Economic recession	Economic	3.60
	Demands from professionals for greater access to study programs	Relations with Professionals	3.60
3	Continued low priority by government for education	Political	3.58
4	Computer technology	Technological	3.52
5	Lack of money from university sources needed to hire teaching assistants	Economic	3.44
6	Quotas regarding the numbers of students admitted to programs	Internal Dynamics of Universities	3.28
7	Limited staff mobility	Internal Dynamics of Universities	3.25
8	Aging faculty	Internal Dynamics of Universities	3.20

Table 7
(continued)

Rank	Environmental Force	Category	Mean of Forecasted Likelihood of Affecting Departments
9	Increased demand for post-secondary education as a means to assuring the individual a more competitive position in the employment market	Societal Dynamics	3.08
10	Faculty retirements	Internal Dynamics of Universities	3.04
	Shortage of support (clerical) staff	Economic	3.04
11	A high unemployment rate among young people	Economic	3.00
	Greater emphasis on standards of scholarship	Internal Dynamics of Universities	3.00
12	Developments in special programs	Internal Dynamics of Universities	2.84
13	Relatively low demand in the employment market for graduates	Economic	2.79
14	Social demand for education. Demand for study programs coming from the public at large	Societal Dynamics	2.75

Table 7
(continued)

Rank	Environmental Force	Category	Mean of Forecasted Likelihood of Affecting Departments
15	Curricular reform	Internal Dynamics of Universities	2.68
	Decrease in funds available for research	Economic	2.68
16	Demands from professionals for increases in inservice training	Relations with Professionals	2.64
17	Growing opportunities in some fields due to emerging government support	Political	2.63
18	Changes in the nature and composition of the student population	Internal Dynamics of Universities	2.56
19	Demand for post-secondary education from foreign countries -- especially developing countries	Societal Dynamics	2.52
	A shift in priorities from undergraduate to graduate training	Internal Dynamics of Universities	2.52
	Pressure on universities for greater cooperation and knowledge sharing from industry or other significant organizations in the environment	Relations with External Organizations	2.52

Table 7
(continued)

Rank	Environmental Force	Category	Mean of Forecasted Likelihood of Affecting Departments
20	Society's aging population	Societal Dynamics	2.48
21	A desire on the part of faculties and departments for greater flexibility in programs	Internal Dynamics of Universities	2.44
22	Pressure from professional associations	Relations with Professionals	2.36
23	Relatively high demand in the employment market for graduates	Economic	2.26
24	Gradual increase in direct public involvement in significant educational decisions	Societal Dynamics	2.24
25	Alternative types of post-secondary education available	Relations with External Organizations	2.20
26	Pressure from accrediting agencies or similar organizations	Relations with Professionals	2.17
27	Demands for education resulting from developments in specific industries	Relations with External Organizations	2.04
28	Decline in size and change in the nature of the family unit	Societal Dynamics	1.88

of forces dominates. Thus, one is tempted to conclude that no single group of environmental forces can be singled out as primary in terms of the likelihood of affecting the selected departments in the next five years. As a result one may be inclined to reject popular generalizations such as "It's all a matter of money...". and so forth.

This conclusion would be misleading however. Although several different categories of forces are represented in the first seven ranks, a careful examination of the forces reveals that most of them are either directly or indirectly connected with economics. In other words, in the perceptions of respondents, monetary forces dominate in the first seven ranks.

It should be remembered in connection with this point that the categories of forces developed for this round were basically arbitrary. Thus, although useful from the point of view of organizing the data, they should not be applied so rigidly as to possibly distort the perceptions of respondents.

Ranks 8 through 14 contain nine forces. Four among these represent forces relating to the internal operations of universities. These are the aging faculty, faculty retirements, greater emphasis on standards of scholarship, and developments in special programs. Three forces represent the category of economic forces. These are the shortage of support (clerical) staff, the high unemployment rate among young people, and the relatively low demand in the employment market for graduates. The remaining two forces represent forces arising from dynamics within the society as a whole. These are the increased demand for post-secondary education as a means to assuring the individual a more competitive position in the employment market and the demand for study programs coming from the public at large.

Among these forces there is no single dominant group. Instead, dominance seems to be shared between the forces arising due to the internal operations of the universities and economic forces. Forces arising due to dynamics in the society as a whole are secondary.

Ranks 15 through 21 are made up of ten forces. Four among these represent the category of forces relating to the internal operations of universities. These are curricular reform, changes in the nature and composition of the student population, a shift in priorities from undergraduate to graduate training, and a desire on the part of faculties and departments for greater flexibility in programs. Two forces represent the group relating to dynamics within the society as a whole. These are the demand for post-secondary education from foreign countries--especially developing countries and society's aging population. In addition, ranks 15 through 21 contain one force representing each of the following categories: economic forces, political forces, forces arising from relations between universities and professionals, and forces arising from relations between universities and other significant organizations in the environment. The forces, in respective order, are the decrease in funds available for research, growing opportunities in some fields due to emerging government suport, demands from professionals for increases in inservice training, and pressure on universities for greater cooperation and knowledge sharing from industry and other significant organizations in the environment.

The most significant category of forces among these ranks is that relating to the internal operations of universities.

Ranks 22 through 28 contain seven forces. Among these ranks there seems to be no group of forces which clearly dominates. Two forces represent the category of forces arising from relations between universities and professionals. These are pressure from professional associations and pressure from accrediting agencies and similar organizations. Two forces represent the forces arising from dynamics in society as a whole. They are the gradual increase in direct public involvement in significant educational decisions and the decline in size and change in the nature of the family unit. And, two forces represent the category of forces arising from relations between universities and other significant organizations in the environment. These are alternative types of post-secondary education available and the demands for education resulting from developments in specific industries. As well, one force among these ranks represents the category of economic forces. This is the relatively high demand in the employment market for graduates of some programs.

To summarize this section of the analysis, monetary forces (including mainly those forces classified as economic and political on the questionnaire for Round II), forces relating to the internal dynamics of the universities and computer technology were those forces perceived by respondents as potentially the most significant in terms of the likelihood of affecting the selected departments in the next five years. Of lesser significance were relations between universities and professionals and the dynamics within society as a whole.

Forecasted Levels of Impact of the Environmental Forces on Programs of Study in the Science and Education Departments Selected in the Next Five Years. Table 8 shows the estimated levels of impact of the environmental forces on admissions, content, and interaction regarding programs of study for the departments selected in the next five years. The forces are ranked according to the means of the forecasted likelihood of affecting both the science and the education departments selected. The levels of impact shown in the table correspond to the levels outlined earlier in Tables 4, 5, and 6.

As regards the forecasted impact of the environmental forces on admissions to programs of study, ten of the forces outlined by respondents were reported as likely to have a moderate impact. These were:

1. Government policies of fiscal restraint,
2. Economic recession,
3. Continued low priority by government for education,
4. Lack of money from university sources needed to hire teaching assistants,
5. Quotas on the numbers of students admitted to programs,

Table 8

Forecasted Levels of Impact of the Environmental Forces on Programs of Study in the Science and Education Departments Selected in the Next Five Years (Forces are Rank-Ordered by Means of Forecasted Likelihood of Affecting Departments Selected)

Environmental Force	Estimated Impact on		
	Admissions	Content	Interaction
Government policies of fiscal restraint	Moderate	Low	Low
Economic recession	Moderate	Low	Moderate
Demands from professionals for greater access to study programs	Low	Low	Low
Continued low priority by government for education	Moderate	Low	Low
Computer technology	Low	Moderate	Moderate
Lack of money from university sources needed to hire teaching assistants	Moderate	Low	Moderate
Quotas regarding the numbers of students admitted to programs	Moderate	Low	Low
Limited staff mobility	Negligible	Low	Low
Aging faculty	Negligible	Low	Low
Increased demand for post-secondary education as a means to assuring the individual a more competitive position in the employment market	Moderate	Low	Low

Table 8
(continued)

Environmental Force	Estimated Impact on Admissions	Estimated Impact on Content	Estimated Impact on Interaction
Faculty retirements	Negligible	Low	Low
Shortage of support (clerical) staff	Low	Negligible	Low
A high unemployment rate among young people	Moderate	Low	Low
Greater emphasis on standards of scholarship	Moderate	Low	Low
Developments in special programs	Low	Moderate	Low
Relatively low demand in the employment market for graduates	Moderate	Low	Low
Social demand for education. Demand for study programs coming from the public at large	Low	Low	Low
Curricular reform	Low	Moderate	Low
Decrease in funds available for research	Low	Low	Low
Demands from professionals for increases in inservice training	Low	Low	Low

Table 8
(continued)

Environmental Force	Estimated Impact on Admissions	Content	Interaction
Growing opportunities in some fields due to emerging government support	Low	Low	Low
Changes in the nature and composition of the student population	Moderate	Low	Low
Demand for post-secondary education from foreign countries -- especially developing countries	Low	Low	Low
A shift in priorities from under-graduate to graduate training	Low	Low	Low
Pressure on universities for greater cooperation and knowledge sharing from industry and other significant organizations in the environment	Low	Low	Low
Society's aging population	Low	Negligible	Low
A desire on the part of faculties and departments for greater flexibility in programs	Low	Low	Low
Pressure from professional associations	Low	Low	Low

Table 8
(continued)

Environmental Force	Estimated Impact on Admissions	Estimated Impact on Content	Estimated Impact on Interaction
Relatively high demand in the employment market for graduates	Low	Low	Negligible
Gradual increase in direct public involvement in significant educational decisions	Low	Low	Low
Alternative types of post-secondary education available	Low	Low	Low
Pressure from accrediting agencies or similar organizations	Low	Low	Low
Demands for education resulting from developments in specific industries	Low	Low	Negligible
Decline in size and change in the nature of the family unit	Negligible	Negligible	Negligible

6. Increased demand for post-secondary education as a means to assuring the individual a more competitive position in the employment market,
7. A high unemployment rate among young people,
8. Greater emphasis on standards of scholarship,
9. Relatively low demand in the employment market for graduates, and
10. Changes in the nature and composition of the student population.

The remainder of the environmental forces outlined by respondents were rated as likely to have either a low or a negligible impact on admissions to programs.

Three of the environmental forces outlined by respondents were considered as likely to have a moderate impact on the content of study programs. These were:

1. Computer technology,
2. Developments in special programs, and
3. Curricular reform.

The remaining forces were rated as likely to have either a low or a negligible impact on content.

Again, three of the forces identified by respondents were rated as likely to have a moderate impact on interactions between instructors and students. These were:

1. Economic recession,
2. Computer technology, and
3. The lack of money from university sources needed to hire teaching assistants.

The remaining forces were estimated as likely to have either a low or a negligible impact on interactions.

Comparison of the Estimated Effects of the Environmental Forces on Programs of Study in the Science and Education Departments Selected. Tables 9, 10, and 11 show the differences between the faculties selected with respect to the estimated impact of the environmental forces on programs of study. Table 12 shows the significant differences between the faculties represented as identified by the t-Test. Significant differences occurred in two areas: (1) the area of the estimated likelihood of forces affecting the two faculties represented and (2) the area of the forecasted impact of the forces on the content of study programs.

In both groups of departments computer technology was forecasted as a leading environmental force for the next five years. Respondents from the science departments, however, rated computer technology as significantly higher in potential influence than did respondents from education departments. Actually, computer technology heads the list of environmental forces rank-ordered by means of the likelihood of affecting the science departments selected.

Respondents from the education departments selected estimated the low demand for graduates as significantly more potentially influential in terms of the development of their departments than did the respondents from the science departments selected. Respondents representing the education departments considered the low demand for

Table 9

Comparison of the Estimated Impact of the Environmental Forces on Admissions to Programs of Study Between the Science and Education Departments Selected in the Next Five Years

Environmental Force	Science Departments			Education Departments		
	Mean	Standard Deviation	Number	Mean	Standard Deviation	Number
Government policies of fiscal restraint	3.18	0.98	11	3.21	0.70	14
Economic recession	2.64	0.81	11	3.07	0.92	14
Demands from professionals for greater access to study programs	1.91	0.83	11	2.29	0.99	14
Continued low priority by government for education	2.73	1.19	11	2.54	1.13	13
Computer technology	2.09	1.04	11	2.00	1.11	14
Lack of money from university sources needed to hire teaching assistants	3.00	0.89	11	2.77	1.09	13
Quotas regarding the number of students admitted to programs	3.64	0.51	11	3.21	1.19	14
Limited staff mobility	1.10	0.32	10	1.43	0.85	14
Aging faculty	1.18	0.41	11	1.43	0.65	14

Table 9
(continued)

Environmental Force	Science Departments Mean	Science Departments Standard Deviation	Science Departments Number	Education Departments Mean	Education Departments Standard Deviation	Education Departments Number
Increased demand for post-secondary education as a means to assuring the individual a more competitive position in the employment market	3.00	0.63	11	2.62	0.96	13
Faculty retirements	1.18	0.41	11	1.71	0.99	14
Shortage of support (clerical) staff	1.45	0.69	11	1.79	0.80	14
A high unemployment rate among young people	2.73	0.91	11	2.93	0.92	14
Greater emphasis on standards of scholarship	2.91	0.94	11	2.93	0.83	14
Developments in special programs	2.55	0.93	11	2.14	1.17	14
Relatively low demand in the employment market for graduates	2.55	0.93	11	2.71	0.99	14
Social demand for education. Demand for study programs coming from the public at large	2.36	0.81	11	2.46	0.88	13

Table 9
(continued)

Environmental Force	Science Departments			Education Departments		
	Mean	Standard Deviation	Number	Mean	Standard Deviation	Number
Curricular reform	2.00	0.89	11	1.79	0.96	14
Decrease in funds available for research	1.36	0.51	11	1.64	0.75	14
Demands from professionals for increases in inservice training	1.82	0.60	11	2.36	0.93	14
Growing opportunities in some fields due to emerging government support	2.27	0.91	11	2.15	0.69	13
Changes in the nature and composition of the student population	2.45	0.69	11	2.64	1.01	14
Demand for post-secondary education from foreign countries -- especially developing countries	2.36	0.92	11	2.29	1.20	14
A shift in priorities from undergraduate to graduate training	2.09	0.94	11	2.57	1.09	14

Table 9
(continued)

Environmental Force	Science Departments			Education Departments		
	Mean	Standard Deviation	Number	Mean	Standard Deviation	Number
Pressure on universities for greater cooperation and knowledge sharing from industry or other significant organizations in the environment	1.55	0.69	11	1.50	0.76	14
Society's aging population	1.91	0.94	11	2.07	1.07	14
A desire on the part of faculties and departments for greater flexibility in programs	2.18	0.75	11	1.93	0.83	14
Pressure from professional associations	1.73	0.79	11	2.21	0.80	14
Relatively high demand in the employment market for graduates	2.64	0.81	11	2.00	0.94	10
Gradual increase in direct public involvement in significant educational decisions	1.90	0.99	10	1.64	0.84	14
Alternative types of post-secondary education available	2.18	0.87	11	2.14	1.10	14

Table 9
(continued)

Environmental Force	Science Departments			Education Departments		
	Mean	Standard Deviation	Number	Mean	Standard Deviation	Number
Pressure from accrediting agencies or similar organizations	1.30	0.48	10	1.86	1.03	14
Demands for education resulting from developments in specific industries	1.91	1.04	11	1.36	0.50	14
Decline in size and change in the nature of the family unit	1.55	0.69	11	1.43	0.65	14

Table 10

Comparison of the Estimated Impact of the Environmental Forces on the Content of Programs of Study Between the Science and Education Departments Selected in the Next Five Years

	Science Departments			Education Departments		
Environmental Force	Mean	Standard Deviation	Number	Mean	Standard Deviation	Number
Government policies of fiscal restraint	2.09	1.04	11	2.00	1.04	14
Economic recession	1.64	0.92	11	2.08	0.95	13
Demands from professionals for greater access to study programs	2.09	0.94	11	2.14	1.03	14
Continued low priority by government for education	1.82	0.87	11	1.77	0.93	13
Computer technology	3.09	0.70	11	2.93	0.83	14
Lack of money from university sources needed to hire teaching assistants	2.36	1.12	11	1.85	0.99	13
Quotas regarding the number of students admitted to programs	1.90	0.74	10	2.00	0.88	14
Limited staff mobility	1.90	1.10	10	1.93	1.00	14
Aging faculty	1.82	0.87	11	2.14	0.66	14

Table 10
(continued)

	Science Departments			Education Departments		
Environmental Force	Mean	Standard Deviation	Number	Mean	Standard Deviation	Number
Increased demand for post-secondary education as a means to assuring the individual a more competitive position in the employment market	2.55	0.82	11	1.92	0.95	13
Faculty retirements	1.64	0.81	11	2.43	0.94	14
Shortage of support (clerical) staff	1.45	0.69	11	1.50	0.65	14
A high unemployment rate among young people	1.36	0.51	11	2.00	1.04	14
Greater emphasis on standards of scholarship	2.36	1.12	11	2.43	0.85	14
Developments in special programs	2.73	1.10	11	2.50	1.09	14
Relatively low demand in the employment market for graduates	1.82	0.60	11	2.00	1.00	13
Social demand for education. Demand for study programs coming from the public at large	2.45	0.82	11	2.00	1.00	13

Table 10
(continued)

Environmental Force	Science Departments			Education Departments		
	Mean	Standard Deviation	Number	Mean	Standard Deviation	Number
Curricular reform	3.09	0.70	11	2.64	1.15	14
Decrease in funds available for research	1.27	0.47	11	2.07	0.92	14
Demands from professionals for increases in inservice training	2.00	0.77	11	2.29	0.83	14
Growing opportunities in some fields due to emerging government support	2.09	0.70	11	2.31	0.86	13
Changes in the nature and composition of the student population	1.64	0.67	11	2.07	1.00	14
Demand for post-secondary education from foreign countries -- especially developing countries	1.36	0.51	11	1.79	0.89	14
A shift in priorities from undergraduate to graduate training	2.09	0.94	11	2.43	1.09	14

Table 10
(continued)

Environmental Force	Science Departments Mean	Science Departments Standard Deviation	Science Departments Number	Education Departments Mean	Education Departments Standard Deviation	Education Departments Number
Pressure on universities for greater cooperation and knowledge sharing from industry or other significant organizations in the environment	2.27	0.79	11	1.86	0.87	14
Society's aging population	1.36	0.51	11	1.54	0.78	13
A desire on the part of faculties and departments for greater flexibility in programs	2.36	0.81	11	2.21	1.05	14
Pressure from professional associations	2.18	0.75	11	2.07	0.83	14
Relatively high demand in the employment market for graduates	1.90	0.74	10	1.50	0.85	10
Gradual increase in direct public involvement in significant educational decisions	2.00	1.16	10	1.85	0.90	13

Table 10
(continued)

Environmental Force	Science Departments			Education Departments		
	Mean	Standard Deviation	Number	Mean	Standard Deviation	Number
Alternative types of post-secondary education available	1.27	0.47	11	2.00	1.24	14
Pressure from accrediting agencies or similar organizations	2.00	0.94	10	1.93	1.07	14
Demands for education resulting from developments in specific industries	2.27	1.10	11	1.50	0.76	14
Decline in size and change in the nature of the family unit	1.36	0.67	11	1.54	0.78	13

Table 11

Comparison of the Estimated Impact of the Environmental Forces on Instructor/Student Interaction Between the Science and Education Departments Selected in the Next Five Years

Environmental Force	Science Departments			Education Departments		
	Mean	Standard Deviation	Number	Mean	Standard Deviation	Number
Government policies of fiscal restraint	2.55	1.13	11	2.21	1.05	14
Economic recession	2.45	0.93	11	2.54	0.88	13
Demands from professionals for greater access to study programs	1.91	0.94	11	2.00	0.88	14
Continued low priority by government for education	2.64	1.03	11	1.92	0.86	13
Computer technology	3.27	1.01	11	3.00	0.78	14
Lack of money from university sources needed to hire teaching assistants	3.09	0.94	11	2.54	1.05	13
Quotas regarding the numbers of students admitted to programs	2.20	1.03	10	2.21	0.98	14
Limited staff mobility	2.00	0.94	10	1.93	1.07	14
Aging faculty	2.09	1.04	11	2.14	0.95	14

Table 11
(continued)

Environmental Force	Science Departments Mean	Science Departments Standard Deviation	Science Departments Number	Education Departments Mean	Education Departments Standard Deviation	Education Departments Number
Increased demand for post-secondary education as a means to assuring the individual a more competitive position in the employment market	2.45	0.93	11	1.92	0.95	13
Faculty retirements	1.91	1.14	11	2.14	0.95	14
Shortage of support (clerical) staff	2.09	1.04	11	1.57	0.76	14
A high unemployment rate among young people	1.91	0.83	11	1.93	0.92	14
Greater emphasis on standards of scholarship	2.36	1.12	11	2.43	1.02	14
Developments in special programs	2.45	0.82	11	2.21	1.12	14
Relatively low demand in the employment market for graduates	1.55	0.69	11	1.62	0.96	13
Social demand for education. Demand for study programs coming from the public at large	2.00	1.00	11	1.92	0.95	13

Table 11
(continued)

Environmental Force	Science Departments			Education Departments		
	Mean	Standard Deviation	Number	Mean	Standard Deviation	Number
Curricular reform	2.73	1.10	11	2.29	0.91	44
Decrease in funds available for research	1.91	0.94	11	1.79	0.89	14
Demands from professionals for increases in inservice training	1.73	0.79	11	2.43	1.02	14
Growing opportunities in some fields due to emerging government support	1.91	0.70	11	1.69	0.86	13
Changes in the nature and composition of the student population	1.82	0.87	11	2.36	1.15	14
Demand for post-secondary education from foreign countries -- especially developing countries	1.82	0.75	11	1.79	0.98	14
A shift in priorities from undergraduate to graduate training	1.91	0.94	11	2.21	0.98	14

Table 11
(continued)

Environmental Force	Science Departments			Education Departments		
	Mean	Standard Deviation	Number	Mean	Standard Deviation	Number
Pressure on universities for greater cooperation and knowledge sharing from industry or other significant organizations in the environment	1.91	0.94	11	1.71	0.91	14
Society's aging population	1.73	1.01	11	1.69	0.75	13
A desire on the part of faculties and departments for greater flexibility in programs	2.18	0.75	11	2.14	0.86	14
Pressure from professional associations	1.73	0.79	11	1.86	0.77	14
Relatively high demand in the employment market for graduates	1.60	0.70	10	1.30	0.68	10
Gradual increase in direct public involvement in significant educational decisions	1.60	0.97	10	1.77	0.73	13

Table 11
(continued)

Environmental Force	Science Departments			Education Departments		
	Mean	Standard Deviation	Number	Mean	Standard Deviation	Number
Alternative types of post-secondary education available	1.55	0.69	11	1.86	1.17	14
Pressure from accrediting agencies or similar organizations	1.50	0.71	10	1.57	0.85	14
Demands for education resulting from developments in specific industries	1.55	0.93	11	1.36	0.63	14
Decline in size and change in the nature of the family unit	1.36	0.67	11	1.38	0.51	13

Table 12

Questionnaire Items of Significant Difference Between the Two Groups Studied (1* and 2**) as Identified by the t-Test

Forecasted Likelihood of Environmental Factors Affecting Selected Departments in the Next Five Years					
Environmental Force	Group	Number	Mean	Standard Deviation	Pooled or Separate Variance Estimate 2-Tail Probability
Computer technology	1	11	3.82	0.41	0.040
	2	14	3.29	0.73	
Relatively low demand in the employment market for graduates of your faculty or department	1	11	2.45	0.82	0.049
	2	13	3.08	0.64	
Demands from professionals for increases in inservice training	1	11	2.18	0.41	0.003
	2	14	3.00	0.78	
Changes in the nature and composition of the student population	1	11	2.18	0.60	0.026
	2	14	2.86	0.77	

*Respondents representing the science departments selected.
**Respondents representing the education departments selected.

Table 12
(continued)

Environmental Force	Group	Number	Mean	Standard Deviation	Pooled or Separate Variance Estimate 2-Tail Probability
	Estimated Impact on Content of Study Programs				
Faculty retirements	1	11	1.64	0.81	0.036
	2	14	2.43	0.94	
Decrease in funds available for research	1	11	1.27	0.47	0.010
	2	14	2.07	0.92	

graduates a leading environmental force. The force was ranked seventh overall. In the case of the science departments the force was ranked thirteenth overall.

Respondents from the education departments selected rated demands from professionals for increases in inservice training as ninth on the list of forces. In contrast, respondents from the science departments selected rated the force as sixteenth (fourth from last). One can conclude, based on the general nature of responses to questionnaire items regarding inservice operations that inservice work is more common among professionals in education than in science.

Changes in the nature and composition of the student population, as a force, was considered significantly greater in its potential to affect education departments than science departments in the next five years. In neither faculty, however, was the force considered a leading environmental factor.

The potential impact of faculty retirements on the content of study programs was rated as significantly higher by respondents in the education departments than by respondents in the science departments. Again, however, in neither case was the force considered to be central to the development of study programs in the next five years.

The effects of the decrease in funds available for research with respect to the content of study programs were forecasted as likely to be significantly greater for education departments than for science departments. Again, in neither case was the force regarded by respondents as a leading one in the development of study programs.

Summary of Round II

The aim of Round II was to have respondents rate the environmental forces identified in Round I. The questionnaire required that respondents rate each force, first of all, for its likelihood of affecting their departments in the next five years and, secondly, for its potential impact on admissions to study programs, the content of study programs, and instructor/student interaction in programs.

Questionnaires were given to 28 individuals in the departments studied. Most were people currently holding the rank of professor.

The environmental forces rated by respondents as potentially the most significant to the operation of their departments in the next five years were:

1. Monetary forces. This group included economic forces and political forces involving government policies of fiscal restraint.
2. Forces relating to the internal operations of the universities.
3. Computer technology.

Forecasted by respondents as of potentially lesser significance were:

1. Dynamics within the society as a whole.
2. Forces arising from relations between universities and professionals.

Effects of the environmental forces on study programs were forecasted mostly in the area of admissions. Lesser degrees of impact were predicted in the areas of program content and instructor/student interaction.

In comparing the questionnaire responses between the two faculties studied significant differences occured in two areas: (1) in the forecasted likelihood of forces affecting the departments, and (2) in the predicted impact of the forces on the content of programs of study.

As regards the likelihood of forces affecting the departments selected in the next five years, the following significant differences were observed:

1. Respondents representing science departments rated computer technology as significantly more potentially influential than did respondents representing education departments.
2. Respondents representing education departments estimated the low demand for graduates as significantly more potentially influential than did respondents from science departments.
3. Respondents from education departments forecasted demands from professionals for increases in inservice training as potentially more important than did respondents from science departments.
4. Respondents from education departments rated changes in the nature and composition of the student population as significantly more important than did respondents from science departments.

In terms of the impact of the forces on the content of programs of study the following differences were seen:

1. Respondents representing education departments rated faculty retirements as potentially more influential than did respondents representing science departments.

2. Respondents from education departments estimated the decrease in funds available for research as of potentially greater influence than did respondents from science departments.

Round III

Overview

Those forces rated in Round II as potentially the most significant to the operation of the departments in the next five years were used as the basis for the interview schedule of Round III. The focus of the final round was on specific problems expected by respondents in the coming years in connection with the actions of the monetary forces, the forces relating to the internal operations of the universities, and computer technology. Round III also required that respondents outline formal or informal goals held by their departments relating to the development of study programs. Respondents were then asked to specify practical options--in terms of organization and policy-making--available to their departments for achieving the goals of program development.

Interviews were held with five individuals at the Universities of Alberta and Calgary. Three of the respondents were people currently holding the position of chairman in their departments. One was a senior professor and former chairman and one was an administrative officer for a department.

Copies of a summary of Rounds I and II and the interview schedue for Round III were given to respondents several days in advance of the interviews. The purpose of the interview seemed clear to respondents as no problems relating to it occurred.

Specific Problems Expected in Connection with the Monetary Forces

Representatives of both faculties studied suggested that problems arising from the actions of the monetary forces would be central to the development of their departments in the coming years. In the words of one respondent, "The thunder of the monetary forces is overwhelming. It blocks out everything else."

The main difficulty associated with the monetary forces which the science departments expect in the next five years is that much needed growth in numbers of academic personnel will not occur. The science departments are currently dealing with relatively large numbers of students in programs of study. One effect of this is a strain on instructors. Respondents anticipate that due basically to a lack of financial support they will be unable to increase the size of their academic staffs in the coming years to the levels necessary to ease the strain.

Representatives of the science departments also forecasted a likely increase in the role played by the federal government in the area of research. Growing portions of research grants given to science faculties by the province are tagged for specific (utilitarian) projects. Provincial support for "free" research is steadily declining. However, support for "free" research from the federal government is growing. Respondents from the science departments predicted the continued development of the trend toward greater levels of support for science from the federal government.

Individuals representing the education departments also predicted problems due to a shortage of academic staff. Education departments are also experiencing relatively large numbers of students in programs of study at the present time. Inasmuch as staff increases have been minimal the effect, as in science, is a strain on instructors. In addition, however, a number of retirements are expected in the education departments in the coming years and due to the lack of financial support the positions left vacant are not expected to be filled. Thus, the education departments--notwithstanding relatively high enrollments--may be faced with a gradual reduction in staff sizes. This would mean even greater pressure on instructors.

Specific Problems Expected Due to the Internal Dynamics of the Universities

Representatives of both the science and the education faculties predicted a significant increase in the size of the bureaucracies of their faculties in the coming years. This growth in university bureaucracy is expected as a result of efforts aimed at developing greater degrees of coordination among university groups. It is expected to lead to a standardization of policy within faculties. It is also expected to result in a loss of autonomy both for departments and for individuals.

As part of this trend toward centralization respondents also forecasted the introduction of regulations aimed at increasing the levels of accountability of departments and individuals to faculty administrations. Regulations are expected in a number of areas. Two specific areas cited were finance and the behaviour of academic staff members. Some respondents foresee the introduction of penalties for departments who overspend their budgets and a close monitoring of the actions of academic staff members for the purpose of encouraging a more or less uniform pattern of action.

As a result of this trend toward greater degrees of coordination some respondents predicted increased conflict and the deterioration of communications between departments and faculty administrations.

In the area of relations between science faculties and the central administrations of the universities respondents forecasted continued indifference on the part of central administrations to the goal of some science departments of making research the primary function. Respondents representing some science departments pointed out that research should be the primary function of their departments and teaching should be a secondary function. They insisted that university central administrations have thus far failed to recognize this and they predicted a continued failure to do so. They forecasted continued difficulties in maintaining research personnel owing to the refusal of universities to sponsor what they regard as adequate numbers of research fellowships.

Respondents in the education faculties also forecasted a growth in faculty bureaucracies. Their concern was that resources necessary for the development and maintenance of the machinery of coordination would ultimately be taken from the areas of teaching and research.

Specific Problems Expected Due to the Introduction of Computer Technology

Representatives of both faculties studied forecasted the widespread use of computers in the universities in the next five years. Inasmuch as computer technology is a rapidly developing field and the broad application of computers has only recently begun to be seen, it is understandably difficult to make even short-term forecasts in this area. Nonetheless, two clear-cut predictions were outlined.

The first was that some money would inevitably be taken from department budgets, at least as a temporary measure, in order to cover the costs of installation. Some form of budgetary reorganization for the purpose of adapting and maintaining computer systems was forecasted for the longer term.

Secondly, some respondents forecasted a reorganization of the functions, activities, and locations of work of some employees of the universities--most notably members of support staffs. Minor adjustment problems were forecasted in connection with this.

Impact of the Forces Expected on Admissions to Programs of Study

Apparently, the most significant problem to confront the faculties studied in the coming years will be the relative decline in available resources. Universities' enrollments have been on the increase in recent years and infusions of resources have not kept pace. Part of the solution may lie in determining ways in which existing resources can be extended in order to accommodate the increased demands. At some point, however, the loss in effectiveness would make this approach counterproductive.

In connection with this problem, virtually all respondents forecasted the introduction of some form of control on the numbers of students admitted to programs. As a result of controls on admissions respondents representing the science departments predicted an increase in the quality of students admitted to programs. The term "quality" in this context was used by respondents in reference to cognitive capabilities.

Respondents representing the education departments predicted an increase in students enrolled in programs on a part-time basis. This prediction is consistent with the information gathered in Round II stating that practitioners in the field of education show a relatively high rate of participation in upgrading and inservice work. One effect of this would be an increase in the numbers of evening classes.

Impact of the Forces Expected on the Content of Programs of Study

Respondents representing the science departments predicted no significant change in the content of programs of study in the next five years.

Representatives of the education departments predicted the general deterioration of programs of study. First of all, the quality of instruction in courses is expected to decline. Course material is expected to become dated owing to increased staff workloads. Expanded workloads will leave less time for lecture preparation. Secondly, the reduction or elimination of some program requirements is expected. Extended written projects or other current requirements which demand a high degree of supervision are expected to be reduced or withdrawn.

None of the individuals interviewed reported foreseeing computers occupying anything but a peripheral role in classroom instruction in the next five years. However, some science experts expect laboratory sessions to be oriented toward the use of computers at all levels of their undergraduate programs. They also anticipate that undergraduate students with sufficient knowledge of computer operations will be invited to assist staff members in research projects.

Impact of the Forces Expected on Instructor/Student Interaction

Respondents in both faculties predicted a decline in the numbers of interactions between instructors and small groups of students and between instructors and individual students. This, again, will be the result of the increased demand expected to be placed on academic personnel. The problem is expected to be most acute in undergraduate programs. The ultimate effect, as reported by respondents in both faculties, will be a decline in the quality of instruction offered and a corresponding decrease in general academic standards.

Goals for the Development of Study Programs

Each respondent was asked to outline the goals (formal or informal) relating to programs of study which his particular department is currently moving toward.

Representatives of the science departments differed somewhat with respect to goals. However, certain clear preferences for future development were presented. These included: (1) shaping department expertise through retirements and hirings so as to emphasize some areas and deemphasize others, (2) placing increased emphasis on graduate-level instruction and decreased emphasis on undergraduate instruction, (3) increasing contacts with high schools with the aim of elevating standards of high-school science, and (4) offering a broader range of general interest courses in science to the public at large.

Respondents from the education departments reported having no specific goals for the development of study programs at the present time. Some respondents, however, stated that their departments are in the process of preparing statements of guidelines in order to meet the changing demands for instruction.

Options Available to the Departments for Meeting Their Emerging Needs

Respondents were asked to outline practical ways in which their departments could respond to changing conditions in order to achieve their goals for the development of study programs. Inasmuch as the main problem expected to confront the departments in the next five years is the relative decline in resources, suggestions for ways of meeting future needs tended to focus on the more effective use of resources--particularly academic staff.

Representatives of the science departments made the following suggestions: (1) Decrease the emphasis presently given to committees. Instead of referring problems to committees for study the suggestion was that they be assigned to individual staff members. (2) Eliminate courses on the periphery of core study programs. This would free resources for use in areas more central in importance. (3) Reduce the numbers of students admitted to programs of study. This would make for a reduction in time commitments for instructors.

Respondents from the education departments also suggested reducing the numbers of students admitted to programs. In addition, they made the following suggestions: (1) Reduce the academic requirements in some courses or programs. This would reduce time commitments for instructors. (2) Develop strategies for seconding greater numbers of staff out to other organizations--both within the university and outside of it--with the aim of using the money saved to hire sessional instructors. (3) Reconsider some of the semi-voluntary commitments which exist in relation to other groups within the universities.

In general, the practice of developing goals and strategies does not appear to hold high priority for department leaders. Situations arise from circumstances over which department leaders have little or no control. Thus, plans would have to be modified continually in response to what are often rapidly changing situations. In this context, detailed planning would grow to resemble mere reaction to changing situations and would, thus, be of limited value in the longer term. It appears, then, that department leaders see planning more in terms of defining--quite informally--broad guidelines for operations.

Summary of Round III

Round III had two main purposes. The first was to gather respondents' forecasts of the specific problems which their departments will face in the next five years as a result of the actions of the monetary forces, the forces relating to the internal operations of the universities, and computer technology. The second was to have respondents outline goals for the development of study programs held by their departments as well as practical options available at the departmental level for achieving the goals.

The primary problem predicted as a result of the monetary forces was a continued strain on academic staff owing to increases in student numbers. Respondents predicted that due to a lack of financial support their departments will be unable to increase the size of academic staffs in the next few years to the levels necessary to deal effectively with the increased demand for study programs.

The central problem forecasted as a result of the internal dynamics of the universities was growth in faculty bureaucracies. This growth in bureaucracies was forecasted as a result of efforts on the part of universities to increase levels of coordination and boost efficiency. Respondents predicted corresponding losses of autonomy both for departments and for individual staff members.

The main difficulty expected as a result of the increasing use of computers was a reorganization of budgets which would see money needed for the operation of computer systems taken from the areas of teaching and research.

As regards the impact of the forces on programs of study offered, respondents predicted some form of control on the numbers of students admitted. The purpose of restricting admissions was seen as one means of dealing with the problem of the overextension of resources. As a result of controls on admissions, some respondents forecasted an increase in the average ability of students enrolled.

With respect to course content and instructor/student interaction, some respondents predicted deterioration. Content and interaction were forecasted as likely to decline in quality due to increased staff workloads. The ultimate result predicted was an overall decline in academic standards.

The goals for the development of study programs as outlined by the respondents did not appear to be products of detailed, systematic planning. Instead, goals resembled informal general guidelines for future operations. Options available to the departments for achieving their goals, in general, reflected the need for reductions in time commitments for academic staff members.

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CHAPTER 7

Summary, Implications, and Recommendations for Further Research

This chapter presents an overall summary of the study. The research problem is briefly outlined, the methodology is reviewed, and the findings of the study are presented. In addition, certain implications for the future development of universities are outlined. Lastly, a number of recommendations for further research are given.

Summary of the Study

Research Problem

The development of universities in Alberta since 1908 has been characterized by continual expansion. This expansion has been based partly on generous financial support from governments and partly on support in enrollments from the public at large. In recent years, however, signs have emerged which indicate an end to expansion. Some authors have even gone as far as to predict that the coming years will be a period of decline for universities (Fincher, Furniss, et al., 1978). Thus, the future of universities in Alberta, as elsewhere in Canada, at the present time is uncertain.

This study attempted to provide a means for a synthesis of views of expert individuals in the areas of faculty and department operations on future development in Alberta's major universities. The study focused specifically on the future development of programs of study in selected faculties at the Universities of Alberta and Calgary.

The primary purposes of the study were as follows: (1) to identify environmental forces expected to affect the operations of certain departments in the Faculties of Science and Education at the Universities of Alberta and Calgary in the years 1983-1988, (2) to forecast the likely effects of the environmental forces on programs of study offered, and (3) to list practical options available to university departments for dealing with the problems expected in the area of program development. A secondary purpose in the study was to outline differences in the response patterns of the groups representing the two faculties studied.

Methodology

Data collection. The study used a technique somewhat resembling the Delphi method. Three separate rounds of data collection were carried out. Each round brought the addition of new data based on that of the round before.

The focus of the study moved from the general to the specific. In the first round of questioning respondents were asked to outline environmental forces operating both inside of the universities and outside which seemed likely to have an important impact on the operations of the faculties and departments studied in the next five years. The questionnaire contained open-ended questions. Data for Round I after processing consisted of a list of 34 environmental forces. In the second round of questionning respondents were asked to rate each force, first, for its likelihood of occurrence and, second, for its potential impact on admissions to study programs, the content of programs, and instructor/student interaction in programs. The questionnaire was made up of a list of the forces gathered in Round I and scales for rating each force. Data for Round II after processing consisted of a list of those forces forecasted by respondents as potentially the most significant to the operations of the selected departments in the coming years and forecasts of the likely effects of the forces on study programs. In Round III respondents were asked to discuss specific problems which they expected their departments to face in the next five years in connection with the forces forecasted in Round II as likely to be most significant. They were also asked to outline any goals their departments have in the area of program development as well as practical options--in terms of organization and policy-making--available to departments for achieving the goals.

Data analysis. Principles of content analysis were used to analyze the data assembled. Content analysis refers to a collection of methods for providing systematic interpretations of communication data. The technique typically involves four steps:

1. Unitizing Data. This means dividing data into individual units.

2. Categorizing Data. This refers to sorting data units into categories in some logical way.
3. Measuring Content. This means noting specific characteristics in the data.
4. Assuring Reliability and Validity. This refers to establishing soundness in terms of internal constructs as well as in relation to replicability.

Analysis of data for Round I consisted of unitizing responses, sorting the data units into categories, and labelling the categories. Analysis in Round II involved ranking the environmental forces using frequency analysis, noting those forces predicted as most significant in terms of expected impact on study programs and comparing response patterns between the two faculties represented with the use of a t-Test. Analysis of data for Round III again involved reducing remarks to individual themes and sorting the thematic units into categories.

Respondents. Respondents for the study were chosen on the basis of administrative and professional experience in the faculties and departments involved. Prior to the distribution of questionnaires for Round I sixteen individuals were contacted and agreed to take part in the study. Four of these were deans, eight were department chairmen, two were senior professors, and two were administrative officers. Eight questionnaires were returned. Before distributing the questionnairs for Round II 20 additional respondents were contacted. All were full professors. The purpose of introducing this group was to boost the number of respondents after the low rate of return in Round I. Data collection in Round III involved personal interviews with five selected respondents. Three of these were department chairmen, one was a senior professor, and one was an administrative officer. The respondents involved in Round III were believed to have taken part in both earlier rounds.

Findings of the Study

Identification of environmental forces. Analysis of the data gathered in Round I showed that 34 environmental forces had been identified. The forces were placed into the following categories:

1. Economic Forces,
2. Political Forces,
3. Technological Forces,
4. Forces Arising Due to Dynamics Within the Society as a Whole,
5. Forces Relating to the Internal Dynamics of the Universities,
6. Forces Arising from Relations Between Universities and Professionals and
7. Forces Arising from Relations Between Universities and Other Significant Organizations in the Environment.

Identification of the dominant environmental forces. An examination of the data for Round II revealed that three types of forces were viewed by respondents as potentially the most significant to the future operations of the faculties and departments studied. These were:

1. Monetary Forces (including primarily those forces classified as economic and political in Round I),
2. Forces Relating to the Internal Dynamics of the Universities and
3. Technological Forces (specifically computer technology).

Forecasted levels of impact of the environmental forces on programs of study offered. In addition to indicating those forces seen by respondents as potentially dominant in the coming years, the data for Round II also showed respondents' predictions of the effects of the forces on admissions to study programs, the content of study programs, and instructor/student interaction in programs.

As regards the impact of the forces on admissions, ten of the forces identified were forecasted as likely to have a moderate impact. These were:

1. Government policies of fiscal restraint,
2. Economic recession,
3. Continued low priority by government for education,
4. Lack of money from university sources needed to hire teaching assistants,
5. Quotas on the numbers of students admitted to programs,
6. Increased demand for post-secondary education as a means to assuring the individual a more competitive position in the employment market,
7. A high unemployment rate among young people,

8. Greater emphasis on standards of scholarship,
9. Relatively low demand in the employment market for graduates and
10. Changes in the nature and composition of the student population.

The remainder of the environmental forces outlined were forecasted as likely to have either a low or a negligible impact on admissions to programs.

In terms of content, three of the environmental forces outlined were rated by respondents as likely to have a moderate impact. They were:

1. Computer technology,
2. Developments in special programs and
3. Curricular reform.

The remaining forces were rated as likely to have either a low or a negligible effect on the content of study programs.

Regarding interactions between instructors and students, again, three of the forces identified were rated by respondents as likely to have a moderate impact. These were:

1. Economic recession,
2. Computer technology and
3. The lack of money from university sources needed to hire teaching assistants.

The remaining forces were forecasted as likely to have either a low or negligible impact on instructor/student interaction.

Comparison of the forecasted effects of the environmental forces on programs of study between the science and education faculties. Significant differences between the two faculties represented in the study occurred in the following two areas:

1. The forecasted likelihood of environmental forces affecting the departments studied and,
2. The forecasted impact of the forces on the content of study programs.

As regards the likelihood of environmental forces affecting the departments selected, representatives of the science departments saw computer technology as significantly more potentially influential than did representatives of the education departments. Representatives of the education departments saw the low demand for graduates, the demands from professionals for increases in inservice training, and the change in the nature and composition of the student population as significantly more potentially influential than did representatives of the science departments.

In terms of the impact of the forces on the content of study programs, respondents from the education departments forecasted faculty retirements and the decrease in funds available for research as significantly more potentially influential than did respondents from the science departments.

Analysis of the data gathered in Round III showed a number of specific problems expected by the departments in connection with the effects of the dominant environmental forces.

Specific problems anticipated in connection with the monetary forces. Two specific problems were predicted as likely to result from the monetary forces. They were:

1. The overextension of academic staff. Respondents predicted that due basically to a lack of financial support departments will be unable to increase the size of their academic staffs in the coming years to the levels necessary to prevent a strain on instructors.
2. A decrease in the financial support for scientific research provided by the provincial government. Respondents representing some of the science departments noted that increasing portions of research grants given to science faculties by the provincial government are tagged for utilitarian projects. Thus, provincial support for "free" research is now declining. Respondents also forecasted an increase in the role played by the federal government in the area of research funding.

Specific problems anticipated due to the internal dynamics of the universities. As a result of the internal dynamics of the universities four specific problems were forecasted. They were:

1. An increase in the size of the bureaucracies of faculties. Growth in faculty bureaucracies is expected in connection with efforts aimed at achieving greater levels of coordination and efficiency within the universities.

2. A reorganization of budgets for the purpose of building and maintaining larger faculty bureaucracies.
3. Increased conflict and the deterioration of relations between faculty administrations and individual departments.
4. Continued indifference on the part of central administrations of the universities to the goals of some science departments of making research the primary function.

Specific problems anticipated due to the introduction of computer technology. Two problems were predicted by respondents in connection with the introduction of computers on a large scale in the universities. They were:

1. The reorganization of university budgets to cover costs of introducing, maintaining, and upgrading computer systems and
2. Minor adjustment problems for members of support staffs associated with the reorganization of functions, activities, and in some cases locations of work.

Specific impact of the dominant forces expected on programs of study offered. Data for Round III showed respondents' forecasts of specific ways in which faculties and departments will be affected by the dominant forces.

As regards the specific impact on admissions to programs of study, three forecasts were given. They were:

1. Some form of control on the numbers of students admitted to study programs. Restrictions on enrollments were seen as a means of balancing workloads with available resources.
2. An increase in the average level of cognitive capability of students.
3. Some respondents in the education faculties forecasted an increase in students enrolled in programs on a part-time basis.

Respondents representing the science faculties forecasted no notable change in the content of study programs in the next five years. Respondents representing the education faculties predicted the general deterioration of programs of study. The quality of content was seen as likely to decline owing to increased staff workloads. Expanding workloads were seen as likely to leave less time for the preparation of lectures as well as for the supervision of extended written projects.

Regarding the specific impact of the dominant forces on instructor/student interaction, representatives of both faculties made the same predictions. They were:

1. A decline in the numbers of interaction between instructors and small groups of students and between instructors and individual students.
2. A decline in the quality of instruction offered and a corresponding drop in academic standards.

Options available to departments for meeting future problems and needs. Data gathered in Round III showed a number of options available to departments for dealing with anticipated problems and for achieving goals.

Representatives of the science departments outlined the following options:

1. Decrease the emphasis presently given to committees. Instead of assigning problems to committees for study individuals could be asked to prepare reports. This would reduce time commitments of instructors.
2. Eliminate courses on the periphery of core study programs. This would free resources for use in areas more central in importance.
3. Reduce the numbers of students admitted to programs of study. Again, this would reduce time commitments of instructors.

In addition to certain of the above-mentioned options representatives of the education departments suggested the following:

1. Reduce the academic requirements in some courses or programs. This would lower time commitments of instructors.
2. Develop strategies for seconding greater numbers of academic staff out to other organizations--both within the university and outside--with the aim of using the money saved to hire sessional instructors.
3. Reconsider some of the semi-voluntary commitments to other units within the university with the aim of using the money saved for department costs.

Rational Implications for Future University Development

According to Meyer and Rowan (1978), the structure of an organization is a reflection of the particular set of environmental conditions within which it operates. As environments change so must organizations' structures. In an ideal typical sense, environmental forces acting together bring pressure to bear on specific aspects of organizations which then make characteristic adjustments.

In this section an outline is presented of some possible adjustments which universities can be expected to make in the longer term. Of particular importance is the problem of dwindling financial support and it is in response to this that most adjustments are expected.

Inasmuch as development policy in universities, as in other organizations, is grounded in extra-rational as well as rational thinking, this section is not specifically intended as a collection of firm forecasts of future conditions in universities. Instead, it is presented as a set of possible outcomes based on a rational assessment of current trends.

A New Plan of Operation

As universities enter the period of retrenchment they can be expected to move toward increased levels of centralization in their operations. Authority and responsibility among members will be more sharply defined, decision-making will generally shift upward, and the tendency will be to rely more heavily on rules of procedure. The purpose in centralizing will be to provide services in as cost effective a manner as possible.

Cyert (1975), in discussing the specific problems of non-profit organizations, argues that the main difficulty in operating in a decentralized way is finding a large enough supply of competent managers to operate effectively. He suggests that because of the chronically inadequate supply of managerial talent most well-managed non-profit organizations tend toward the centralized model.

As part of this shift toward centralized operations universities can also be expected to move toward the development of a real set of overall organizational goals. Universities are diverse communities and under conditions of expansion adoption of a statement of goals would be virtually impossible. However, under conditions of severe contraction the sheer force of need coupled with the increased power of central authorities could result in the development of a set of overall goals or at least in moves in that direction.

Clearly defined goals would serve two important purposes. First, they would provide a focus for efforts including those associated with the allocation of resources. As Cyert (1975) points out, without a clear understanding among members of an organization of a set of overall goals operations tend to be ambiguous and arbitrary. Second, goals would provide a basic framework for the resolution of internal conflict.

Further to the issue of goals, universities in the coming years will be compelled to re-examine the specific areas in which they offer services. This could mean the elimination of peripheral academic or support units. It could also mean mergers between units carrying out similar activities with the aim of reducing or eliminating overlapping functions and responsibilities.

Universities are also expected to redefine the rules of tenure. Signs exist at present which indicate that this process is already underway. As a result of the reconstruction of tenure rules and owing in part to the generally more precarious position of universities under conditions of retrenchment moves can be expected in the direction of the unionization of academic staffs.

Inasmuch as retrenchment is a condition resulting primarily from a prolonged shortage of financial support universities can be expected in the coming years to examine seriously new methods of obtaining revenue. Although presently forbidden by tradition from using sophisticated business and marketing strategies severe decline may compel universities to consider moves in this direction. In the words of Cyert (1975:16), "Once [the need for marketing] is recognized it is desirable to utilize the knowledge and methods of analysis developed by business organizations." The result, according to Cyert (1975) would be increased revenues based on clearer conceptions of relevant needs as they exist in governments, the private sector, and in the public at large.

A Systematic Method of Allocating Resources

Universities are also expected in the coming years to move toward a systematic procedure for distributing resources. This can be viewed as an outcome of the development of a set of overall organizational goals. According to Cyert (1975:18):

> Within academic organizations, resource allocation tends to be on a historical basis though student choice may affect this occasionally. In other words, budget allocations tend to be made to each unit on the basis of the unit's previous allocation, taking into account changes in the total resources available for allocation. Thus the tendency is for the organization to do next year what it is doing this year.

Allocating resources systematically will mean distributing resources among units not on a historical basis but instead with attention to the overall organizational goals. Requests for increased levels of resources will be presented in terms of the increased quality of services to be offered as a result.

As Cyert (1975) points out, in this context there may occur in organizational units a tendency toward complacency: a kind of fatalism based on the reality of the organizational goals. This could lead to stagnation among units. Responsibility will rest with administrators to design a system which rewards worthwhile innovation while at the same time adhering to the principles of the overall goals.

Accountability in Management

As the period of retrenchment progresses universities will be forced to upgrade their standards of management. At present universities look to experienced scholars to carry out administrative functions. Professors make the transition to managers with little or no management training. They typically remain in management positions for fixed periods based on tradition and few if any measures are applied for the purpose of evaluating managerial performance.

Fabozzi (1975) believes that highly competent managers are essential in organizations experiencing contraction. The conditions of decline which universities are facing will result in pressure for university administrators to resemble more closely managers in public - or private-sector organizations in terms of outlooks and skills than professors.

Two possible outcomes can be inferred from this. First, individuals occupying management positions will require appropriate managerial training. This means either that professors coming into management will be given intensive training in the principles of business management or that professional managers will be employed. Second, realistic procedures for evaluating managerial performance will be introduced. As a matter of illustration of this latter point, Cyert (1975) recommends the use of indexes representing all of the variables (areas of operation) for which particular groups of managers are responsible. The result would be a standardized indication of performance.

Implications for University Planning

One useful approach to futures forecasting for university planners would be to assemble a range of types of data before beginning analysis. A many-sided approach to forecasting could influence results of studies in two beneficial ways. First, it could reduce the practical problems in assembling data associated with an over-reliance on a certain data source. Second, it could result in relatively higher levels of validity for the results of studies. Results related in some way to levels of corroboration may prove higher in validity than results based on single sources of data.

Recommendations for Further Research

As a result of this study a number of recommendations for further research can be made.

Applications of the conventional form of the Delphi method should be avoided except in situations in which the respondents are under a real obligation to cooperate. As an alternative, studies could be done which involve combining a number of recognized data gathering techniques. A collection of methods applied simultaneously would result in a more stable data gathering process.

Studies should be carried out which have as their purpose the refinement of the Delphi technique. Such studies could focus on comparing levels of validity and reliability of results of conventional Delphis with results obtained from applications of variations of the method. As a matter of illustration, a study could be undertaken which compared the effectiveness of the conventional method with a design involving the selection of a new panel of respondents for each round of questioning. This particular design could have the effect of involving a broad range of experts while at the same time providing an important hedge against large-scale opting out by panel members.

Also, studies should be carried out which parallel this one, (albeit using other research techniques) but which focus on other faculties and departments. This would result in a broader base of data relating to environmental forces and their effects in the coming years.

Similarly, studies of the potential impact of the environment on other aspects of university operations (such as research) would be helpful. Corroborating evidence from studies of this type would underline the need for an examination of policies and methods of change necessary in order to prepare universities to meet future problems.

Also helpful would be theoretical models of policy designed for contracting organizations. These would assist university administrators in visualizing goals relating to the management of universities in decline.

Studies involving practical aspects of organizational contraction would also be useful. These would provide university administrators with some sense of the utilitarian difficulties to be overcome in managing decline.

Summary

This final chapter provided an overall summary of the study as well as a discussion of some of the implications for future development in universities based on the findings.

In summarizing the study, first of all, the research problem was outlined. Then the methodology of the study was discussed. The main focus in terms of research techniques was on the principles and methods used in gathering and analyzing the data. Following this a brief description of the respondents was given.

The largest part of the chapter involved a summary of the findings of the study. The research questions were answered. Environmental forces important to the operations of the selected faculties and departments in the coming years were identified, the likely effects of the forces on programs of study were listed, and options available to departments for dealing with problems expected in relation to program development were presented.

Following the summary of the findings of the study some logical implications of the emerging situation for university operations as a whole were discussed.

Finally, a number of ideas for further research were presented.

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APPENDIX A

LETTER OF INTRODUCTION

17 March 1983

To:

From: Gerald Sellinger
Doctoral Candidate in Educational Administration

I am writing to seek your assistance in a study which I am carrying out in partial fulfillment of the requirements for the PhD degree in Educational Administration at the University of Alberta.

Your help is requested, first of all, to identify those forces present in the internal and external environments of the universities which are expected to have an impact on the operation of your faculty or department over the next five years and, secondly, to outline the anticipated effects of the environmental forces on the programs of study offered by your faculty or department.

The Delphi technique is the method for gathering data which will be used in this study. The Delphi method involves the particiation of a number of experts in completing a series of questionnaires. Delphi studies are conducted in a manner which ensures the anonymity of responses.

In the course of the next few weeks you will receive three questionnaires by mail. I hope you will be able to complete and return each one as you receive it.

I would be pleased to give you a summary of the findings of the study after it has been completed if you so wish.

I will be calling you within the next few days to inquire whether you will be participating in the study and to answer any questions you may have.

I appreciate the fact that you are busy but hope you will find time to take part in the study.

Yours truly,

APPENDIX B

PACKAGE OF MATERIALS

ROUND I

April 15, 1983

Thank you for agreeing to act as a respondent in this study of environmental forces and their possible effects on programs of study in selected faculties in Alberta's universities over the next five years.

The study will involve three rounds of questioning. Each questionnaire will build on the information obtained in the previous round.

I would be pleased to give you a summary of the findings of the study after it has been completed if you are interested in them. The information generated by the study should prove useful to anyone concerned with educational planning in post-secondary institutions.

Please complete the Personal Data sheet and return it with the Round I Questionnaire.

Each sheet of each questionnaire will contain an identification code number. The purpose of this code is to ensure accuracy in the compiling of information. Please be assured that your response will remain confidential.

As the questions require some consideration, please allow yourself ample time to formulate responses.

If you would like to discuss the questionnaire, please call me at 463-4524.

Yours truly,

Gerald Sellinger
Doctoral Candidate

PERSONAL DATA

Name: ____

Mailing Address: ____________________________________

____

____________________ Postal Code __________

Telephone Number (days): ______________ (evenings): __________

Name of Secretary or Assistant: ___________________________

Your Present Position: ___________________________________

Length of Time in Present Position: ________________________

Previous Position (most recent): ___________________________

Length of Time in Previous Position: _______________________

THE DELPHI METHOD

In a Delphi study, a carefully chosen panel of experts pursues a topic through a series of questionnaires. The purpose of a Delphi study is: (a) to explore possible future developments in relation to a particular topic; (b) to encourage indepth consideration of a problem by qualified people; and (c) to facilitate the exchange of ideas among experts in a particular area. The result of a Delphi study is a compilation of expert opinion.

In most Delphis, agreement to participate is understood as an obligation on the part of the respondent to complete each questionnaire as it is presented. As part of this agreement, a respondent also has certain rights:

1. He/she may consult sources of information normally available to him for the purpose of answering a question (so long as the answer he states is his opinion and does not represent the opinion of a group for which he is a spokesman).

2. He may restate a question and answer that one if he believes the original to be misleading.

3. He may support responses with brief remarks.

4. He may choose not to respond to a question if he believes his judgement to be too uncertain.

5. He may comment on the design of any of the questionnaires and make suggestions for changes.

6. He may question the response summaries he receives if he believes that his response(s) have been incorrectly interpreted.

7. He may communicate with the researcher at any time for clarification of his task.

ENVIRONMENTAL FORCES AND
UNIVERSITY STUDY PROGRAMS 1983 - 1988

ROUND I QUESTIONNAIRE

IDENTIFICATION OF ENVIRONMENTAL FORCES

INSTRUCTIONS

1. Please identify environmental forces both inside and outside of the University which you believe will be significant to the operation of your faculty or department in the years 1983-1988.

2. Space has been given for 15 responses but this is not, in any way, intended as a guideline for respondents. If you wish to list more or fewer responses please do so. If you wish to list more than 15 responses please use the reverse sides of any of the questionnaire sheets.

3. Please do not feel that your choice of environmental forces should be limited to those listed on the following page. The list of environmental forces presented is intended only as an aid to your deliberations. Include any environmental forces which you see as significant.

4. State your reason for each choice.

DEADLINE

As preparations for Round II cannot begin until all responses for Round I have been returned, please adhere to the deadline of May 2, 1983.

SOME EXAMPLES OF ENVIRONMENTAL FORCES

1. Social demand for education (demand for study programs coming from the public at large).

2. Professional demand for education (demand for more qualified personnel coming from the professions themselves).

3. Demand for education resulting from developments in specific industries, e.g., the agriculture industry, the resource industry.

4. Inflation.

5. Trends in the economy.

6. Shifts in government priorities.

7. Government policies of fiscal restraint.

8. Trends toward centralization or decentralization of services in Alberta.

9. Operation of alternative types of post-secondary educational institutions.

10. Pressure from professional associations or accrediting agencies.

11. Computer technology.

12. Developments in the fields of study represented in your faculty or department.

13. Academic staff as a pressure group.

14. Divergence among academic staff regarding academic matters.

15. Changes in the nature and composition of the student population.

16. Changes in the labour market for graduates.

17. Students' demands for more influence in the operation of universities.

18. Curricular reform in your faculty or department or within the university as a whole.

Your forecast of the environmental forces significant to the operation of your faculty or department in the years 1983-1988:

1. Force:

Reason for Importance:

2. Force:

Reason for Importance:

3. Force:

Reason for Importance:

4. Force:

Reason for Importance:

5. Force:

Reason for Importance:

6. Force:

Reason for Importance:

7. Force:

Reason for Importance:

8. Force:

Reason for Importance:

9. Force:

Reason for Importance:

10. Force:

Reason for Importance:

11. Force:

Reason for Importance:

12. Force:

Reason for Importance:

13. Force:

Reason for Importance:

14. Force:

Reason for Importance:

15. Force:

Reason for Importance:

Additional Comments:

Thank you for your cooperation!

APPENDIX C

PACKAGE OF MATERIALS

ROUND II

31 May 1983

To:

From: Gerald Sellinger

I am a student in the PhD program in Educational Administration. My dissertation involves trying to forecast the direction that education in some of Alberta's university faculties will take in the next five years.

This is my second questionnaire. The purpose of the first was to gather a collection of those environmental forces which deans of certain faculties and chairmen of departments believe will have an important impact on their operations in the next five years. The purpose of this questionnaire is to assemble the ideas of experienced academic staff members regarding the effects of the environmental forces on programs of study offered.

I hope you will be able to complete this questionnaire and return it in the envelope provided. Please make every effort to return your questionnaire by June 8 as my sample size is quite small and every questionnaire counts. I am aware of the many demands on your time, but hope you will appreciate my position in asking for your help with this study.

Yours sincerely,

Gerald Sellinger

ENVIRONMENTAL FORCES AND
UNIVERSITY STUDY PROGRAMS:
1983 - 1988

QUESTIONNAIRE

DEADLINE

NB: Please have your questionnaire in the mail by Wednesday, June 8, 1983. I must apologize for what may be a difficult deadline. It is an extremely important one, however, in that computer analysis of the data must be completed by June 21. The computer will not be available to me after that time.

INSTRUCTIONS

The environmental forces listed in this questionnaire have been identified by a panel made up of deans of faculties, chairmen of departments, and senior professors.

1. Please consider each environmental force.

2. Please rate each environmental force for the likelihood of its affecting your faculty or department in the next five years, i.e., in the years 1983 to 1988. DO THIS BY CIRCLING THE APPROPRIATE NUMBER.

3. After rating each environmental force, please estimate its impact on the academic study programs offered by your faculty or department in the next five years. DO THIS BY CIRCLING THE APPROPRIATE NUMBERS.

The following questions are intended as an aid in defining the terms Admission, Content, and Interaction as they appear on the questionnaire sheets:

Admission

- Will the requirements for admission be changed?
- Will the numbers of students admitted to study programs change?

Content

- Will new courses be added to the list of those now offered?
- Will some existing courses be terminated?
- Will there be changes in the conceptual material of courses?
- Will there be changes in the rules regarding sequences of courses?

Interaction

- Will there be changes in the ways in which course material is presented to students? e.g., changes to the lecture method; changes in the use of audio-visual technology; changes in instructor/student ratios.

Environmental Forces	Likelihood of Affecting Your Faculty or Department in the Next Five (5) Years				Estimated Impact on Academic Study Programs												CC
					Admission				Content				Interaction				T - 4
	Very Unlikely	Not Likely	Likely	Very Likely	Negligible Impact	Low Impact	Moderate Impact	High Impact	Negligible Impact	Low Impact	Moderate Impact	High Impact	Negligible Impact	Low Impact	Moderate Impact	High Impact	
Economic Forces																	
1. Economic recession	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	5 - 8
2. Relatively low demand in the employment market for graduates of your faculty or department	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	9 - 12
3. Relatively high demand in the employment market for graduates of your faculty or department	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	13 - 16
4. Decrease in funds available for research	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	17 - 20
5. A high unemployment rate among young people	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	21 - 24
6. Lack of money from university sources needed to hire teaching assistants	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	25 - 28
7. Shortage of support (clerical) staff	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	29 - 32
Political Forces																	
8. Government policies of fiscal restraint	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	33 - 36
9. Continued low priority by government for education	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	37 - 40
10. Growing opportunities in some fields due to emerging government support	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	41 - 44

....continued

Environmental Forces	Likelihood of Affecting Your Faculty or Department in the Next Five (5) Years				Estimated Impact on Academic Study Programs												CC T - 4
					Admission				Content				Interaction				
	Very Unlikely	Not Likely	Likely	Very Likely	Negligible Impact	Low Impact	Moderate Impact	High Impact	Negligible Impact	Low Impact	Moderate Impact	High Impact	Negligible Impact	Low Impact	Moderate Impact	High Impact	
Technological Forces																	
11. Computer technology	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	45 - 48
Forces Arising Due to Dynamics Within the Society as a Whole																	
12. Social demand for education. Demand for study programs coming from the public at large	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	49 - 52
13. Increased demand for post-secondary education as a means to assuring the individual a more competitive position in the employment market	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	53 - 56
14. Society's aging population	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	57 - 60
15. Decline in the size and change in the nature of the family unit	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	61 - 64
16. Gradual increase in direct public involvement in significant educational decisions	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	65 - 68
17. Demand for post-secondary education from foreign countries--especially developing countries	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	69 - 72
Forces Relating to the Internal Dynamics of Universities																	
18. Curricular reform	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	73 - 76
19. Developments in special programs	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	77 - 80

....continued

Environmental Forces	Likelihood of Affecting Your Faculty or Department in the Next Five (5) Years				Estimated Impact on Academic Study Programs												CC T - 2/4
					Admission				Content				Interaction				
	Very Unlikely	Not Likely	Likely	Very Likely	Negligible Impact	Low Impact	Moderate Impact	High Impact	Negligible Impact	Low Impact	Moderate Impact	High Impact	Negligible Impact	Low Impact	Moderate Impact	High Impact	
Forces Relating to the Internal Dynamics of Universities (continued)																	
20. A shift in priorities from undergraduate to graduate training	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	5 - 8
21. A desire on the part of faculties and departments for greater flexibility in programs, i.e., to prepare students to the maximum degree possible bearing in mind fluctuations in the employment market	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	9 - 12
22. Changes in the nature and composition of the student population	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	13 - 16
23. Quotas regarding the numbers of students admitted to programs	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	17 - 20
24. Greater emphasis on standards of scholarship	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	21 - 24
25. Limited staff mobility	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	25 - 28
26. Aging faculty	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	29 - 32
27. Faculty retirements	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	33 - 36
Forces Arising from Relations Between Universities and Professionals																	
28. Demands from professionals for greater access to programs	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	37 - 40

....continued

Environmental Forces	Likelihood of Affecting Your Faculty or Department in the Next Five (5) Years				Estimated Impact on Academic Study Programs												CC T - 4
					Admission				Content				Interaction				
	Very Unlikely	Not Likely	Likely	Very Likely	Negligible Impact	Low Impact	Moderate Impact	High Impact	Negligible Impact	Low Impact	Moderate Impact	High Impact	Negligible Impact	Low Impact	Moderate Impact	High Impact	
Forces Arising from Relations Between Universities and Professionals (continued)																	
29. Demands from professionals for increases in inservice training	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	41 - 44
30. Pressure from professional associations	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	45 - 48
31. Pressure from accrediting agencies or similar organizations	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	49 - 52
Forces Arising from Relations Between Universities and Other Significant Organizations in the Environment																	
32. Demands for education resulting from developments in specific industries	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	53 - 56
33. Alternative types of post-secondary education available	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	57 - 60
34. Pressure on universities for greater formal and informal cooperation and knowledge sharing coming from industry or other significant organizations in the environment	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	61 - 64

APPENDIX D

INTERVIEW SCHEDULE

ROUND III

ENVIRONMENTAL FORCES AND UNIVERSITY STUDY PROGRAMS: 1983-1988

Summary of Rounds I and II

The environmental forces forecasted by respondents as potentially the most significant to the operation of the selected departments in the next five years are:

1. Monetary forces (economic forces and political forces involving government policies of fiscal restraint),

2. Forces relating to the internal operations of the universities, and

3. Computer technology.

Estimated by respondents as of potentially lesser significance are:

1. Dynamics within society as a whole, and

2. Forces arising from relations between universities and professionals.

Effects of the environmental forces on study programs are expected mostly in the area of admissions. Not much impact is anticipated by respondents in the areas of program content or instructor/student interaction.

Round III Interview Schedules

1. What specific problems (if any) do you expect your department to face in the next five years in connection with (a) monetary forces, (b) forces relating to the internal operations of the university, and (c) computer technology?

2. What precisely do you expect will be the effects of these problems on admissions, content, and instructor/student interaction in programs of study offered by your department?

3. What goals (formal or informal) relating to the development of study programs does your department have for the next five years?

4. What practical options--in terms of organization and policy making--are available to your department for dealing with the problems so as to aid in achieving the goals of program development?

APPENDIX E

RANK-ORDERED LIST OF ENVIRONMENTAL FORCES BY MEAN OF FORECASTED LIKELIHOOD OF AFFECTING THE SCIENCE DEPARTMENTS SELECTED

Rank-Ordered List of Environmental Forces by Mean of Forecasted Likelihood of Affecting the Science Departments Selected

Rank	Environmental Force	Mean of Forecasted Likelihood of Affecting Science Departments
1	Computer technology	3.82
2	Economic recession	3.55
	Lack of money from university sources to hire teaching assistants	3.55
	Government policies of fiscal restraint	3.55
	Continued low priority by government for education	3.55
3	Quotas regarding the numbers of students admitted to programs	3.45
4	Aging faculty	3.27
5	Limited staff mobility	3.20
6	Increased demand for post-secondary education as a means to assuring the individual a more competitive position in the employment market	3.18
7	A high umemployment rate among young people	3.09
	Greater emphasis on standards of scholarship	3.09
8	Shortage of support (clerical) staff	3.00

Rank	Environmental Force	Mean of Forecasted Likelihood of Affecting Science Departments
9	Developments in special programs	2.91
	Faculty retirements	2.91
10	Curricular reform	2.82
	Pressure on universities for greater formal and informal cooperation and knowledge sharing coming from industry and other significant organizations in the environment	2.82
11	Relatively high demand in the employment market for graduates	2.64
	Social demand for education. Demand for study programs coming from the public at large	2.64
12	Demand for post-secondary education from foreign countries--especially developing countries	2.55
13	Relatively low demand in the employment market for graduates	2.45
	Growing opportunities in some fields due to emerging government support	2.45
	Society's aging population	2.45
	Demands for education resulting from developments in specific industries	2.45

Rank	Environmental Force	Mean of Forecasted Likelihood of Affecting Science Departments
14	Decrease in funds available for research	2.36
	A desire on the part of faculties and departments for greater flexibility in programs, i.e., to prepare students to the maximum degree possible bearing in mind fluctuations in the employment market	2.36
	Demands from professionals for greater access to programs	2.36
15	Gradual increase in direct public involvement in significant educational decisions	2.27
	A shift in priorities from undergraduate to graduate training	2.27
	Pressure from professional associations	2.27
16	Changes in the nature and composition of the student population	2.18
	Demands from profesionals for increases in inservice training	2.18
17	Alternative types of post-secondary education available	2.09
18	Pressure from accrediting agencies or similar organizations	2.00
19	Decline in the size and change in the nature of the family unit	1.91

APPENDIX F

RANK-ORDERED LIST OF ENVIRONMENTAL FORCES BY MEAN OF FORECASTED LIKELIHOOD OF AFFECTING THE EDUCATION DEPARTMENTS SELECTED

Rank-Ordered List of Environmental Forces by Mean of Forecasted Likelihood of Affecting the Education Departments Selected

Rank	Environmental Force	Mean of Forecasted Likelihood of Affecting Education Departments
1	Government policies of fiscal restraint	3.79
2	Economic recession	3.64
3	Continued low priority by government for education	3.62
4	Lack of money from university sources needed to hire teaching assistants	3.36
5	Computer technology	3.29
	Limited staff mobility	3.29
6	Quotas regarding the numbers of students admitted to programs	3.14
	Aging faculty	3.14
	Faculty retirements	3.14
7	Relatively low demand in the employment market for graduates	3.08
8	Shortage of support (clerical) staff	3.07
9	Increased demand for post-secondary education as a means to assuring the individual a more competitive position in the employment market	3.00
	Demands from professionals for increases in inservice training	3.00

Rank	Environmental Force	Mean of Forecasted Likelihood of Affecting Education Departments
10	Decrease in funds available for research	2.93
	A high unemployment rate among young people	2.93
	Greater emphasis on standards of scholarship	2.93
11	Changes in the nature and composition of the student population	2.86
12	Social demand for education. Demand for study programs coming from the public at large	2.85
13	Developments in special programs	2.79
	Demands from professionals for greater access to programs	2.79
14	Growing opportunities in some fields due to emerging government support	2.77
15	A shift in priorities from undergraduate to graduate training	2.71
16	Curricular reform	2.57
17	Society's aging population	2.50
	A desire on the part of faculties and departments for greater flexibility in programs, i.e., to prepare students to the maximum degree possible bearing in mind the fluctuations in the employment market	2.50
	Computer technology	2.50

Rank	Environmental Force	Mean of Forecasted Likelihood of Affecting Education Departments
18	Pressure from professional associations	2.43
19	Pressure from accrediting agencies or similar organizations	2.29
	Alternative types of post-secondary education available	2.29
	Pressure on universities for greater formal and informal cooperation and knowledge sharing coming from industry or other significant organization in the environment	2.29
20	Gradual increase in direct public involvement in significant educational decisions	2.21
21	Relatively high demand in the employment market for graduates	1.92
22	Decline in the size and change in the nature of the family unit	1.86
23	Demands for education resulting from developments in specific industries	1.71

APPENDIX G

t-TABLES

Environmental Forces	Likelihood of Affecting Your Faculty or Department in the Next Five (5) Years					Estimated Impact on Academic Study Programs														
						Admission					Content					Interaction				
	Very Unlikely	Not Likely	Likely	Very Likely		Negligible Impact	Low Impact	Moderate Impact	High Impact		Negligible Impact	Low Impact	Moderate Impact	High Impact		Negligible Impact	Low Impact	Moderate Impact	High Impact	
Economic Forces																				
1. Economic recession	1	2	3	4	(V1)	1	2	3	4	(V2)	1	2	3	4	(V3)	1	2	3	4	(V4)
2. Relatively low demand in the employment market for graduates of your faculty or department	1	2	3	4	(V5)	1	2	3	4	(V6)	1	2	3	4	(V7)	1	2	3	4	(V8)
3. Relatively high demand in the employment market for graduates of your faculty or department	1	2	3	4	(V9)	1	2	3	4	(V10)	1	2	3	4	(V11)	1	2	3	4	(V12)
4. Decrease in funds available for research	1	2	3	4	(V13)	1	2	3	4	(V14)	1	2	3	4	(V15)	1	2	3	4	(V16)
5. A high unemployment rate among young people	1	2	3	4	(V17)	1	2	3	4	(V18)	1	2	3	4	(V19)	1	2	3	4	(V20)
6. Lack of money from university sources needed to hire teaching assistants	1	2	3	4	(V21)	1	2	3	4	(V22)	1	2	3	4	(V23)	1	2	3	4	(V24)
7. Shortage of support (clerical) staff	1	2	3	4	(V25)	1	2	3	4	(V26)	1	2	3	4	(V27)	1	2	3	4	(V28)
Political Forces																				
8. Government policies of fiscal restraint	1	2	3	4	(V29)	1	2	3	4	(V30)	1	2	3	4	(V31)	1	2	3	4	(V32)
9. Continued low priority by government for education	1	2	3	4	(V33)	1	2	3	4	(V34)	1	2	3	4	(V35)	1	2	3	4	(V36)
10. Growing opportunities in some fields due to emerging government support	1	2	3	4	(V37)	1	2	3	4	(V38)	1	2	3	4	(V39)	1	2	3	4	(V40)

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Environmental Forces	Likelihood of Affecting Your Faculty or Department in the Next Five (5) Years	Estimated Impact on Academic Study Programs		
		Admission	Content	Interaction
	Very Unlikely Not Likely Likely Very Likely	Negligible Impact Low Impact Moderate Impact High Impact	Negligible Impact Low Impact Moderate Impact High Impact	Negligible Impact Low Impact Moderate Impact High Impact
Technological Forces				
11. Computer technology	1 2 3 4 (V41)	1 2 3 4 (V42)	1 2 3 4 (V43)	1 2 3 4 (V44)
Forces Arising Due to Dynamics Within the Society as a Whole				
12. Social demand for education. Demand for study programs coming from the public at large	1 2 3 4 (V45)	1 2 3 4 (V46)	1 2 3 4 (V47)	1 2 3 4 (V48)
13. Increased demand for post-secondary education as a means to assuring the individual a more competitive position in the employment market	1 2 3 4 (V49)	1 2 3 4 (V50)	1 2 3 4 (V51)	1 2 3 4 (V52)
14. Society's aging population	1 2 3 4 (V53)	1 2 3 4 (V54)	1 2 3 4 (V55)	1 2 3 4 (V56)
15. Decline in the size and change in the nature of the family unit	1 2 3 4 (V57)	1 2 3 4 (V58)	1 2 3 4 (V59)	1 2 3 4 (V60)
16. Gradual increase in direct public involvement in significant educational decisions	1 2 3 4 (V61)	1 2 3 4 (V62)	1 2 3 4 (V63)	1 2 3 4 (V64)
17. Demand for post-secondary education from foreign countries--especially developing countries	1 2 3 4 (V65)	1 2 3 4 (V66)	1 2 3 4 (V67)	1 2 3 4 (V68)
Forces Relating to the Internal Dynamics of Universities				
18. Curricular reform	1 2 3 4 (V69)	1 2 3 4 (V70)	1 2 3 4 (V71)	1 2 3 4 (V72)
19. Developments in special programs	1 2 3 4 (V73)	1 2 3 4 (V74)	1 2 3 4 (V75)	1 2 3 4 (V76)

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Environmental Forces	Likelihood of Affecting Your Faculty or Department in the Next Five (5) Years					Estimated Impact on Academic Study Programs														
						Admission					Content					Interaction				
	Very Unlikely	Not Likely	Likely	Very Likely		Negligible Impact	Low Impact	Moderate Impact	High Impact		Negligible Impact	Low Impact	Moderate Impact	High Impact		Negligible Impact	Low Impact	Moderate Impact	High Impact	
Forces Relating to the Internal Dynamics of Universities (continued)																				
20. A shift in priorities from undergraduate to graduate training	1	2	3	4	(V77)	1	2	3	4	(V78)	1	2	3	4	(V79)	1	2	3	4	(V80)
21. A desire on the part of faculties and departments for greater flexibility in programs, i.e., to prepare students to the maximum degree possible bearing in mind fluctuations in the employment market	1	2	3	4	(V81)	1	2	3	4	(V82)	1	2	3	4	(V83)	1	2	3	4	(V84)
22. Changes in the nature and composition of the student population	1	2	3	4	(V85)	1	2	3	4	(V86)	1	2	3	4	(V87)	1	2	3	4	(V8[illegible]
23. Quotas regarding the numbers of students admitted to programs	1	2	3	4	(V89)	1	2	3	4	(V90)	1	2	3	4	(V91)	1	2	3	4	(V92)
24. Greater emphasis on standards of scholarship	1	2	3	4	(V93)	1	2	3	4	(V94)	1	2	3	4	(V95)	1	2	3	4	(V96)
25. Limited staff mobility	1	2	3	4	(V97)	1	2	3	4	(V98)	1	2	3	4	(V99)	1	2	3	4	(V100)
26. Aging faculty	1	2	3	4	(V101)	1	2	3	4	(V102)	1	2	3	4	(V103)	1	2	3	4	(V104)
27. Faculty retirements	1	2	3	4	(V105)	1	2	3	4	(V106)	1	2	3	4	(V107)	1	2	3	4	(V108)
Forces Arising from Relations Between Universities and Professionals																				
28. Demands from professionals for greater access to programs	1	2	3	4	(V109)	1	2	3	4	(V110)	1	2	3	4	(V111)	1	2	3	4	(V112)

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Environmental Forces	Likelihood of Affecting Your Faculty or Department in the Next Five (5) Years					Estimated Impact on Academic Study Programs														
						Admission					Content					Interaction				
	Very Unlikely	Not Likely	Likely	Very Likely		Negligible Impact	Low Impact	Moderate Impact	High Impact		Negligible Impact	Low Impact	Moderate Impact	High Impact		Negligible Impact	Low Impact	Moderate Impact	High Impact	
Forces Arising from Relations Between Universities and Professionals (continued)																				
29. Demands from professionals for increases in inservice training	1	2	3	4	(V113)	1	2	3	4	(V114)	1	2	3	4	(V115)	1	2	3	4	(V116)
30. Pressure from professional associations	1	2	3	4	(V117)	1	2	3	4	(V118)	1	2	3	4	(V119)	1	2	3	4	(V120)
31. Pressure from accrediting agencies or similar organizations	1	2	3	4	(V121)	1	2	3	4	(V122)	1	2	3	4	(V123)	1	2	3	4	(V123)
Forces Arising from Relations Between Universities and Other Significant Organizations in the Environment																				
32. Demands for education resulting from developments in specific industries	1	2	3	4	(V125)	1	2	3	4	(V126)	1	2	3	4	(V127)	1	2	3	4	(V128)
33. Alternative types of post-secondary education available	1	2	3	4	(V129)	1	2	3	4	(V130)	1	2	3	4	(V131)	1	2	3	4	(V132)
34. Pressure on universities for greater formal and informal cooperation and knowledge sharing coming from industry or other significant organizations in the environment	1	2	3	4	(V133)	1	2	3	4	(V134)	1	2	3	4	(V135)	1	2	3	4	(V136)

Group 1 - Science
Group 2 - Education

Variable		Number of Cases	Mean	Standard Deviation	Pooled Variance Estimate		Separate Variance Estimate	
					T Value	2-Tail Probability	T Value	2-Tail Probability
V1	Group 1	11	3.5455	0.522	-0.48	0.639	-0.47	-.641
	Group 2	14	3.6429	0.497				
V2	Group 1	11	2.6364	0.809	-1.24	0.228	-1.26	0.221
	Group 2	14	3.0714	0.917				
V3	Group 1	11	1.6364	0.924	-1.14	0.265	-1.15	0.264
	Group 2	13	2.0769	0.954				
V4	Group 1	11	2.4545	0.934	-0.23	0.823	-0.23	0.824
	Group 2	13	2.5385	0.877				
V5	Group 1	11	2.4545	0.820	-2.09	0.049*	-2.04	0.055
	Group 2	13	3.0769	0.641				
V6	Group 1	11	2.5455	0.934	-0.43	0.669	-0.44	0.667
	Group 2	14	2.7143	0.994				
V7	Group 1	11	1.8182	0.603	-0.53	0.604	-0.55	0.590
	Group 2	13	2.0000	1.000				
V8	Group 1	11	1.5455	0.688	-0.20	0.842	-0.21	0.838
	Group 2	13	1.6154	0.961				
V9	Group 1	11	2.6364	0.924	1.89	0.073	1.89	0.073
	Group 2	12	1.9167	0.900				
V10	Group 1	11	2.6364	0.809	1.66	0.112	1.65	0.116
	Group 2	10	2.0000	0.943				
V11	Group 1	10	1.9000	0.738	1.12	0.276	1.12	0.276
	Group 2	10	1.5000	0.850				
V12	Group 1	10	1.6000	0.699	0.98	0.342	0.98	0.342
	Group 2	10	1.3000	0.675				
V13	Group 1	11	2.3636	0.674	-1.52	0.141	-1.61	0.122
	Group 2	14	2.9286	1.072				
V14	Group 1	11	1.3636	0.505	-1.06	0.298	-1.11	0.277
	Group 2	14	1.6429	0.745				
V15	Group 1	11	1.2727	0.467	-2.63	0.015	-2.83	0.010*
	Group 2	14	2.0714	0.917				

* Significant Difference

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Group 1 - Science
Group 2 - Education

Variable		Number of Cases	Mean	Standard Deviation	Pooled Variance Estimate		Separate Variance Estimate	
					T Value	2-Tail Probability	T Value	2-Tail Probability
V16	Group 1	11	1.9091	0.944	0.33	0.741	0.33	0.743
	Group 2	14	1.7857	0.893				
V17	Group 1	11	3.0909	0.701	0.52	0.608	0.53	0.601
	Group 2	14	2.9286	0.829				
V18	Group 1	11	2.7273	0.905	-0.55	0.589	-0.55	0.589
	Group 2	14	2.9286	0.917				
V19	Group 1	11	1.3636	0.505	-1.86	0.075	-2.01	-.058
	Group 2	14	2.0000	1.038				
V20	Group 1	11	1.9091	0.831	-0.05	0.957	-0.06	0.956
	Group 2	14	1.9286	0.917				
V21	Group 1	11	3.5455	0.522	0.80	0.435	0.81	0.424
	Group 2	14	3.3571	0.633				
V22	Group 1	11	3.0000	0.894	0.56	0.582	0.57	0.575
	Group 2	13	2.7692	1.092				
V23	Group 1	11	2.3636	1.120	1.20	0.242	1.19	0.248
	Group 2	13	1.8462	0.987				
V24	Group 1	11	3.0909	0.944	1.34	0.193	1.36	0.189
	Group 2	13	2.5385	1.050				
V25	Group 1	11	3.0000	0.775	-0.22	0.828	-0.22	0.826
	Group 2	14	3.0714	0.829				
V26	Group 1	11	1.4545	0.688	-1.09	-.287	-1.11	0.278
	Group 2	14	1.7857	0.802				
V27	Group 1	11	1.4545	0.688	-0.17	0.867	-0.17	0.868
	Group 2	14	1.5000	0.650				
V28	Group 1	11	2.0909	1.044	1.44	0.162	1.39	0.182
	Group 2	14	1.5714	0.756				
V29	Group 1	11	3.5455	0.522	-1.27	0.217	-1.24	0.231
	Group 2	14	3.7857	0.426				
V30	Group 1	11	3.1818	0.982	-0.10	-.924	-0.09	0.927
	Group 2	14	3.2143	0.699				

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Group 1 - Science
Group 2 - Education

Variable		Number of Cases	Mean	Standard Deviation	Pooled Variance Estimate		Separate Variance Estimate	
					T Value	2-Tail Probability	T Value	2-Tail Probability
V31	Group 1	11	2.0909	1.044	0.22	0.830	0.22	0.830
	Group 2	14	2.0000	1.038				
V32	Group 1	11	2.5455	1.128	0.76	0.456	0.75	0.461
	Group 2	14	2.2143	1.051				
V33	Group 1	11	3.5455	1.128	-0.33	0.743	-0.33	0.744
	Group 2	13	3.6154	0.506				
V34	Group 1	11	2.7273	1.191	0.40	0.694	0.40	0.696
	Group 2	13	2.5385	1.127				
V35	Group 1	11	1.8182	0.874	0.13	0.896	0.13	0.895
	Group 2	13	1.7692	0.927				
V36	Group 1	11	2.6364	1.027	1.85	0.078	1.82	0.083
	Group 2	13	1.9231	0.862				
V37	Group 1	11	2.4545	0.522	-1.20	0.243	-1.23	0.231
	Group 2	13	2.7692	0.725				
V38	Group 1	11	2.2727	0.905	0.37	0.718	0.36	0.725
	Group 2	13	2.1538	0.689				
V39	Group 1	11	2.0909	0.701	-0.67	0.509	-0.68	0.502
	Group 2	13	2.3077	0.855				
V40	Group 1	11	1.9091	0.701	0.67	0.509	0.68	0.502
	Group 2	13	1.6923	0.855				
V41	Group 1	11	3.8182	0.405	2.17	0.040*	2.32	0.030
	Group 2	14	3.2857	0.726				
V42	Group 1	11	2.0909	1.044	0.21	0.837	0.21	0.835
	Group 2	14	2.0000	1.109				
V43	Group 1	11	3.0909	0.701	0.52	0.608	0.53	0.601
	Group 2	14	2.9286	0.829				
V44	Group 1	11	3.2727	1.009	0.76	0.454	0.74	0.469
	Group 2	14	3.0000	0.784				
V45	Group 1	11	2.6364	0.924	-0.69	0.500	-0.66	0.519
	Group 2	13	2.8462	0.555				

* Significant Difference

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Group 1 - Science
Group 2 - Education

Variable		Number of Cases	Mean	Standard Deviation	Pooled Variance Estimate T Value	Pooled Variance Estimate 2-Tail Probability	Separate Variance Estimate T Value	Separate Variance Estimate 2-Tail Probability
V46	Group 1	11	2.3636	0.809	-0.28	0.780	-0.28	0.779
	Group 2	13	2.4615	0.877				
V47	Group 1	11	2.4545	0.820	1.20	0.242	1.22	0.234
	Group 2	13	2.0000	1.000				
V48	Group 1	11	2.0000	1.000	0.19	0.849	0.19	0.850
	Group 2	13	1.9231	0.954				
V49	Group 1	11	3.1818	0.751	0.56	0.579	0.57	0.576
	Group 2	13	3.0000	0.816				
V50	Group 1	11	3.0000	0.632	1.13	0.269	1.17	0.254
	Group 2	13	2.6154	0.961				
V51	Group 1	11	2.5455	0.820	1.70	0.104	1.72	0.100
	Group 2	13	1.9231	0.265				
V52	Group 1	11	2.4545	0.934	1.37	0.184	1.38	0.184
	Group 2	13	1.9231	0.954				
V53	Group 1	11	2.4545	0.688	-0.13	0.894	-0.14	0.890
	Group 2	14	2.5000	0.941				
V54	Group 1	11	1.9091	0.944	-0.40	0.696	-0.40	0.691
	Group 2	14	2.0714	1.072				
V55	Group 1	11	1.3636	0.505	-0.64	0.529	-0.66	0.514
	Group 2	13	1.5385	0.776				
V56	Group 1	11	1.7273	1.009	0.10	0.923	0.09	0.925
	Group 2	13	1.6923	0.751				
V57	Group 1	11	1.9091	0.701	0.17	0.863	0.18	0.862
	Group 2	14	1.8571	0.770				
V58	Group 1	11	1.5455	0.688	0.44	0.666	0.43	0.669
	Group 2	14	1.4286	0.646				
V59	Group 1	11	1.3636	0.674	-0.58	0.566	-0.59	0.561
	Group 2	13	1.5385	0.776				
V60	Group 1	11	1.3636	0.674	-0.09	0.931	-0.08	0.933
	Group 2	14	1.3846	0.893				

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Group 1 - Science
Group 2 - Education

Variable		Number of Cases	Mean	Standard Deviation	Pooled Variance Estimate		Separate Variance Estimate	
					T Value	2-Tail Probability	T Value	2-Tail Probability
V61	Group 1	11	2.2727	0.905	0.16	0.873	0.16	0.873
	Group 1	14	2.2143	0.893				
V62	Group 1	10	1.9000	0.994	0.68	0.501	0.67	0.515
	Group 2	14	1.6429	0.842				
V63	Group 1	10	2.0000	1.155	0.36	0.723	0.35	0.732
	Group 2	13	1.8462	0.899				
V64	Group 1	10	1.6000	0.966	-0.48	0.636	-0.46	0.650
	Group 2	13	1.7692	0.725				
V65	Group 1	11	2.5455	0.688	0.12	0.905	0.13	0.900
	Group 2	14	2.5000	1.092				
V66	Group 1	11	2.3636	0.924	0.18	0.861	0.18	0.856
	Group 2	14	2.2857	1.204				
V67	Group 1	11	1.3636	0.505	-1.40	0.175	-1.49	0.151
	Group 2	14	1.7857	0.893				
V68	Group 1	11	1.8182	0.751	0.09	0.928	0.09	0.926
	Group 2	14	1.7857	0.975				
V69	Group 1	11	2.8182	0.603	0.67	0.508	0.72	0.480
	Group 2	14	2.5714	1.089				
V70	Group 1	11	2.0000	0.894	0.57	0.577	0.57	0.573
	Group 2	14	1.7857	0.975				
V71	Group 1	11	3.0909	0.701	1.13	0.269	1.20	0.243
	Group 2	14	2.6429	1.151				
V72	Group 1	11	2.7273	1.104	1.09	0.285	1.07	0.298
	Group 2	14	2.2857	0.914				
V73	Group 1	11	2.9091	0.539	0.38	0.710	0.40	0.692
	Group 2	14	2.7857	0.975				
V74	Group 1	11	2.5455	0.934	0.93	0.361	0.96	0.348
	Group 2	14	2.1429	1.167				
V75	Group 1	11	2.7273	1.104	0.51	0.612	0.51	0.613
	Group 2	14	2.5000	1.092				

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Group 1 - Science
Group 2 - Education

Variable		Number of Cases	Mean	Standard Deviation	Pooled Variance Estimate		Separate Variance Estimate	
					T Value	2-Tail Probability	T Value	2-Tail Probability
V76	Group 1	11	2.4545	0.820	0.60	0.558	0.62	0.543
	Group 2	14	2.2143	1.122				
V77	Group 1	11	2.2727	0.786	-1.36	0.188	-1.36	0.186
	Group 2	14	2.7143	0.825				
V78	Group 1	11	2.0909	0.944	-1.16	0.258	-1.18	0.250
	Group 2	14	2.5714	1.089				
V79	Group 1	11	2.0909	0.944	-0.81	0.424	-0.83	0.415
	Group 2	14	2.4286	1.089				
V80	Group 1	11	1.9091	0.944	-0.79	0.439	-0.79	0.437
	Group 2	14	2.2143	0.975				
V81	Group 1	11	2.3636	0.505	-0.43	0.669	-0.46	0.647
	Group 2	14	2.5000	0.941				
V82	Group 1	11	2.1818	0.751	0.79	0.438	0.80	0.432
	Group 2	14	1.9286	0.829				
V83	Group 1	11	2.3636	0.809	0.39	0.701	0.40	0.692
	Group 2	14	2.2143	1.051				
V84	Group 1	11	2.1818	0.751	0.12	0.907	0.12	0.905
	Group 2	14	2.1429	0.864				
V85	Group 1	11	2.1818	0.603	-2.39	0.026*	-2.46	0.022
	Group 2	14	2.8571	0.770				
V86	Group 1	11	2.4545	0.688	-0.53	0.602	-0.55	0.585
	Group 2	14	2.6429	1.008				
V87	Group 1	11	1.6364	0.674	-1.24	0.228	-1.30	0.207
	Group 2	14	2.0714	0.997				
V88	Group 1	11	1.8182	0.874	-1.29	0.211	-1.33	0.196
	Group 2	14	2.3571	1.151				
V89	Group 1	11	3.4545	0.522	0.86	0.397	0.93	0.362
	Group 2	14	3.1429					
V90	Group 1	11	3.6364	0.505	1.10	0.283	1.20	0.246
	Group 2	14	3.2143	1.188				

* Significant Difference

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Group 1 - Science
Group 2 - Education

Variable		Number of Cases	Mean	Standard Deviation	Pooled Variance Estimate		Separate Variance Estimate	
					T Value	2-Tail Probability	T Value	2-Tail Probability
V91	Group 1	10	1.9000	0.738	-0.29	0.772	-0.30	0.765
	Group 2	14	2.0000	0.877				
V92	Group 1	10	2.2000	1.033	-0.03	0.973	-0.03	0.973
	Group 2	14	2.2143	0.975				
V93	Group 1	11	3.0909	0.831	0.49	0.632	0.49	0.632
	Group 2	14	2.9286	0.829				
V94	Group 1	11	2.9091	0.944	-0.05	0.957	-0.05	0.957
	Group 2	14	2.9286	0.829				
V95	Group 1	11	2.3636	1.120	-0.16	0.870	-0.16	0.875
	Group 2	14	2.4286	0.852				
V96	Group 1	11	2.3636	1.120	-0.15	0.881	-0.15	0.882
	Group 2	14	2.4286	1.016				
V97	Group 1	10	3.2000	0.789	-0.24	0.813	-0.25	0.808
	Group 2	14	3.2857	0.914				
V98	Group 1	10	1.1000	0.316	-1.16	0.259	-1.32	0.203
	Group 2	14	1.4286	0.852				
V99	Group 1	10	1.9000	1.101	-0.07	0.948	-0.07	0.949
	Group 2	14	1.9286	0.997				
V100	Group 1	10	2.0000	0.943	0.17	0.867	0.17	0.864
	Group 2	14	1.9286	1.072				
V101	Group 1	11	3.2727	0.786	0.33	0.744	0.34	0.734
	Group 2	14	3.1429	1.099				
V102	Group 1	11	1.1818	0.405	-1.11	0.281	-1.17	0.256
	Group 2	14	1.4286	0.646				
V103	Group 1	11	1.8182	0.874	-1.06	0.301	-1.02	0.320
	Group 2	14	2.1429	0.663				
V104	Group 1	11	2.0909	1.044	-0.13	0.898	-0.13	0.899
	Group 2	14	2.1429	0.949				
V105	Group 1	11	2.9091	0.944	-0.64	0.525	-0.64	0.531
	Group 2	14	3.1429	0.864				

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Group 1 - Science
Group 2 - Education

Variable	Number of Cases	Mean	Standard Deviation	Pooled Variance Estimate T Value	Pooled Variance Estimate 2-Tail Probability	Separate Variance Estimate T Value	Separate Variance Estimate 2-Tail Probability
V106 Group 1	11	1.1818	0.405	-1.66	0.110	-1.82	0.085
Group 2	14	1.7143	0.994				
V107 Group 1	11	1.6364	0.809	-2.22	0.036*	-2.27	0.033
Group 2	14	2.4286	0.938				
V108 Group 1	11	1.9091	1.136	-0.56	0.580	-0.55	0.590
Group 2	14	2.1429	0.949				
V109 Group 1	11	2.3636	0.505	-1.52	0.142	-1.61	0.123
Group 2	14	2.7857	0.802				
V110 Group 1	11	1.9091	0.831	-1.01	0.324	-1.03	0.313
Group 2	14	2.2857	0.994				
V111 Group 1	11	2.0909	0.944	-0.13	0.898	-0.13	0.897
Group 2	14	2.1429	1.027				
V112 Group 1	11	1.9091	0.944	-0.25	0.806	-0.25	0.808
Group 2	14	2.0000	0.877				
V113 Group 1	11	2.1818	0.405	-3.14	0.005	-3.37	0.003*
Group 2	14	3.0000	0.784				
V114 Group 1	11	1.8182	0.603	-1.66	0.110	-1.75	0.094
Group 2	14	2.3571	0.929				
V115 Group 1	11	2.0000	0.775	-0.88	0.387	-0.89	0.383
Group 2	14	2.2857	0.825				
V116 Group 1	11	1.7273	0.786	-1.89	0.072	-1.95	0.064
Group 2	14	2.4286	1.016				
V117 Group 1	11	2.2727	0.786	-0.44	0.663	-0.45	0.656
Group 2	14	2.4286	0.938				
V118 Group 1	11	1.7273	0.786	-1.52	0.142	-1.52	0.142
Group 2	14	2.2143	0.802				
V119 Group 1	11	2.1818	0.751	0.34	0.734	0.35	0.731
Group 2	14	2.0714	0.829				
V120 Group 1	11	1.7273	0.786	-0.41	0.682	-0.41	0.683
Group 2	14	1.8571	0.770				

* Significant Difference

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Group 1 - Science
Group 2 - Education

Variable		Number of Cases	Mean	Standard Deviation	Pooled Variance Estimate		Separate Variance Estimate	
					T Value	2-Tail Probability	T Value	2-Tail Probability
V121	Group 1	10	2.0000	0.816	-0.71	0.486	-0.74	0.466
	Group 2	14	2.2857	1.069				
V122	Group 1	10	1.3000	0.483	-1.59	0.127	-1.77	0.091
	Group 2	14	1.8571	1.027				
V123	Group 1	10	2.0000	0.943	0.17	0.867	0.17	0.864
	Group 2	14	1.9286	1.072				
V124	Group 1	10	1.5000	0.707	-0.22	0.830	-0.22	0.825
	Group 2	14	1.5714	0.852				
V125	Group 1	11	2.4545	0.934	2.23	0.036	2.16	0.034
	Group 2	14	1.7143					
V126	Group 1	11	1.9091	1.044	1.75	0.094	1.61	0.129
	Group 2	14	1.3571	0.497				
V127	Group 1	11	2.2727	1.104	2.07	0.050	1.98	0.064
	Group 2	14	1.5000	0.760				
V128	Group 1	11	1.5455	0.934	0.60	0.554	0.57	0.574
	Group 2	14	1.3571	0.633				
V129	Group 1	11	2.0909	0.701	-0.68	0.506	-0.68	0.504
	Group 2	14	2.2857	0.726				
V130	Group 1	11	2.1818	0.874	0.10	0.924	0.10	0.922
	Group 2	14	2.1429	1.099				
V131	Group 1	11	1.2727	0.467	-1.84	0.079	-2.02	0.060
	Group 2	14	2.0000	1.240				
V132	Group 1	11	1.5455	0.688	-0.78	0.442	-0.83	0.414
	Group 2	14	1.8571	1.167				
V133	Group 1	11	2.8182	0.603	1.79	0.086	1.86	0.075
	Group 2	14	2.2857	0.825				
V134	Group 1	11	1.5455	0.688	0.15	0.878	0.16	0.877
	Group 2	14	1.5000	0.760				
V135	Group 1	11	2.2727	0.786	1.24	0.227	1.26	0.222
	Group 2	14	1.8571	0.864				
V136	Group 1	11	1.9091	0.944	0.52	0.607	0.52	0.609
	Group 2	14	1.7143	0.914				

APPENDIX H

HIGHLY SIGNIFICANT CORRELATIONS ($p \leq 0.005$) BETWEEN THE FORECASTED PRIMARY FORCES AND THE ANTICIPATED IMPACT ON ADMISSIONS TO STUDY PROGRAMS AS IDENTIFIED BY THE PEARSON METHOD

Highly Significant Correlations ($p \leq 0.005$) Between the Forecasted Primary Forces[1] and the Anticipated Impact on Admissions to Study Programs as Identified by the Pearson Method

Environmental Force	N	Mean of Forecasted Likelihood of Affecting Departments Selected	Correlation Coefficient	Level of Significance
Government policies of fiscal restraint	24	3.68	0.425	Not Significant
Economic recession	25	3.60	0.548	0.002
Demands from professionals for greater access to study programs	25	3.60	0.838	0.000
Continued low priority by government for education	24	3.58	0.085	Not Significant
Computer technology	25	3.52	0.089	Not Significant
Lack of money from university sources needed to hire teaching assistants	24	3.44	0.472	Not Significant
Quotas regarding the numbers of students admitted to programs	25	3.28	0.889	0.000
Limited staff mobility	24	3.25	0.093	Not Significant

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[1] Primary forces are defined as those environmental forces rank-ordered by mean of the forecasted likelihood of affecting departments selected which appear above the mean of 2.60.

Environmental Force	N	Mean of Forecasted Likelihood of Affecting Departments Selected	Correlation Coefficient	Level of Significance
Aging faculty	25	3.20	0.109	Not Significant
Increased demand for post-secondary education as a means to assuring the individual a more competitive position in the employment market	24	3.08	0.634	0.000
Faculty retirements	25	3.04	0.372	Not Significant
Shortage of support (clerical) staff	25	3.04	0.234	Not Significant
A high unemployment rate among young people	25	3.00	0.547	0.002
Greater emphasis on standards of scholarship	25	3.00	0.770	0.000
Developments in special programs	25	2.84	0.647	0.000
Relatively low demand in the employment market for graduates	24	2.79	0.410	Not Significant
Social demand for education. Demand for study programs coming from the public at large	24	2.75	0.817	0.000
Curricular reform	25	2.68	0.601	0.001

Environmental Force	N	Mean of Forecasted Likelihood of Affecting Departments Selected	Correlation Coefficient	Level of Significance
Decrease in funds available for research	25	2.68	0.213	Not Significant
Demands from professionals for increase in inservice training	25	2.64	0.666	0.000
Growing opportunities in some fields due to emerging government support	24	2.63	0.507	Not Significant

APPENDIX I

HIGHLY SIGNIFICANT CORRELATIONS ($p \leq 0.005$) BETWEEN THE FORECASTED PRIMARY FORCES AND THE ANTICIPATED IMPACT ON THE CONTENT OF STUDY PROGRAMS AS IDENTIFIED BY THE PEARSON METHOD

Highly Significant Correlations ($p \leq 0.005$) Between the Forecasted Primary Forces[1] and the Anticipated Impact on the Concent of Study Programs as Identified by the Pearson Method

Environmental Force	N	Mean of Forecasted Likelihood of Affecting Departments Selected	Correlation Coefficient	Level of Significance
Government policies of fiscal restraint	25	3.68	0.058	Not Significant
Economic recession	24	3.60	0.160	Not Significant
Demands from professionals for greater access to study programs	25	3.60	0.680	0.000
Continued low priority by government for education	24	3.58	0.008	Not Significant
Computer technology	25	3.52	0.418	Not Significant
Lack of money from university sources needed to hire teaching assistants	24	3.44	0.241	Not Significant
Quotas regarding the numbers of students admitted to programs	24	3.28	0.314	Not Significant
Limited staff mobility	24	3.25	0.328	Not Significant

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[1] Primary forces are defined as those environmental forces rank-ordered by mean of the forecasted likelihood of affecting departments selected which appear above the mean of 2.60.

Environmental Force	N	Mean of Forecasted Likelihood of Affecting Departments Selected	Correlation Coefficient	Level of Significance
Aging faculty	25	3.20	0.513	0.004
Increased demand for post-secondary education as a means to assuring the individual a more competitive position in the employment market	24	3.08	0.456	Not Significant
Faculty retirements	25	3.04	0.389	Not Significant
Shortage of support (clerical) staff	25	3.04	0.365	Not Significant
A high unemployment rate among young people	25	3.00	0.245	Not Significant
Greater emphasis on standards of scholarship	25	3.00	0.533	0.003
Developments in special programs	25	2.84	0.743	0.000
Relatively low demand in the employment market for graduates	24	2.79	0.107	Not Significant
Social demand for education. Demand for study programs coming from the public at large	24	2.75	0.649	0.000
Curricular reform	25	2.68	0.832	0.000

Environmental Force	N	Mean of Forecasted Likelihood of Affecting Departments Selected	Correlation Coefficient	Level of Significance
Decrease in funds available for research	25	2.68	0.406	Not Significant
Demands from professionals for increase in inservice training	25	2.64	0.581	0.001
Growing opportunities in some fields due to emerging government support	24	2.63	0.507	Not Significant

APPENDIX J

HIGHLY SIGNIFICANT CORRELATIONS ($p \leq 0.005$) BETWEEN THE FORECASTED PRIMARY FORCES AND THE ANTICIPATED IMPACT ON INSTRUCTOR/STUDENT INTERACTION AS IDENTIFIED BY THE PEARSON METHOD

Highly Significant Correlations ($p \leq 0.005$) Between the Forecasted Primary Forces[1] and the Anticipated Impact on Instructor/Student Interaction as Identified by the Pearson Method

Environmental Force	N	Mean of Forecasted Likelihood of Affecting Departments Selected	Correlation Coefficient	Level of Significance
Government policies of fiscal restraint	25	3.68	0.091	Not Significant
Economic recession	24	3.60	0.098	Not Significant
Demands from professionals for greater access to study programs	25	3.60	0.636	0.000
Continued low priority by government for education	24	3.58	0.131	Not Significant
Computer technology	25	3.52	0.394	Not Significant
Lack of money from university sources needed to hire teaching assistants	24	3.44	0.459	Not Significant
Quotas regarding the numbers of students admitted to programs	24	3.28	0.517	0.005
Limited staff mobility	24	3.25	0.321	Not Significant

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[1] Primary forces are defined as those environmental forces rank-ordered by mean of the forecasted likelihood of affecting departments selected which appear above the mean of 2.60.

Environmental Force	N	Mean of Forecasted Likelihood of Affecting Departments Selected	Correlation Coefficient	Level of Significance
Aging faculty	25	3.20	0.466	Not Significant
Increased demand for post-secondary education as a means to assuring the individual a more competitive position in the employment market	24	3.08	0.505	Not Significant
Faculty retirements	25	3.04	0.320	Not Significant
Shortage of support (clerical) staff	25	3.04	0.301	Not Significant
A high unemployment rate among young people	25	3.00	0.253	Not Significant
Greater emphasis on standards of scholarship	25	3.00	0.294	0.003
Developments in special programs	25	2.84	0.700	0.000
Relatively low demand in the employment market for graduates	24	2.79	0.196	Not Significant
Social demand for education. Demand for study programs coming from the public at large	24	2.75	0.541	0.003
Curricular reform	25	2.68	0.684	0.000

Environmental Force	N	Mean of Forecasted Likelihood of Affecting Departments Selected	Correlation Coefficient	Level of Significance
Decrease in funds available for research	25	2.68	0.281	Not Significant
Demands from professionals for increase in inservice training	25	2.64	0.684	0.000
Growing opportunities in some fields due to emerging government support	24	2.63	0.356	Not Significant